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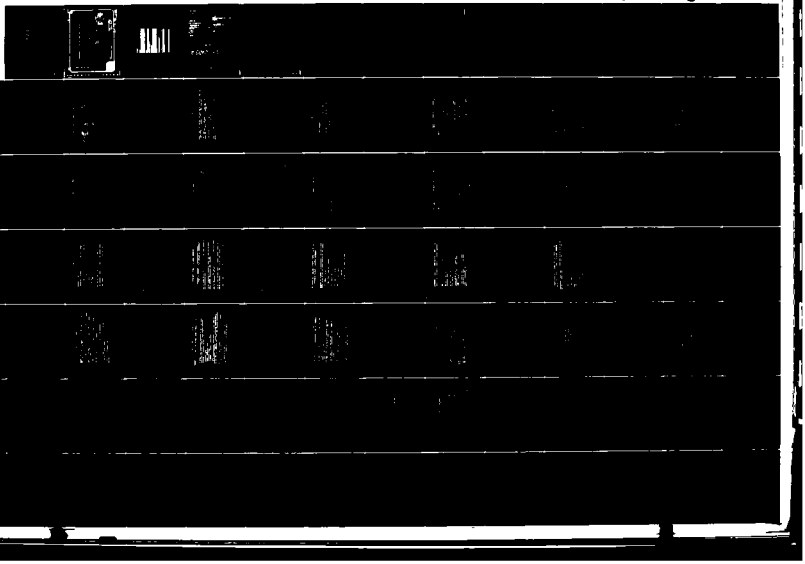

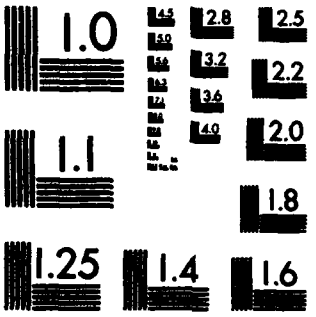

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ASSESSMENT OF ADP FOR USMC FIRE SUPPORT

R. P. Walker, *Project Leader*

November 1988

Prepared for
Office of the Under Secretary of Defense, Acquisition
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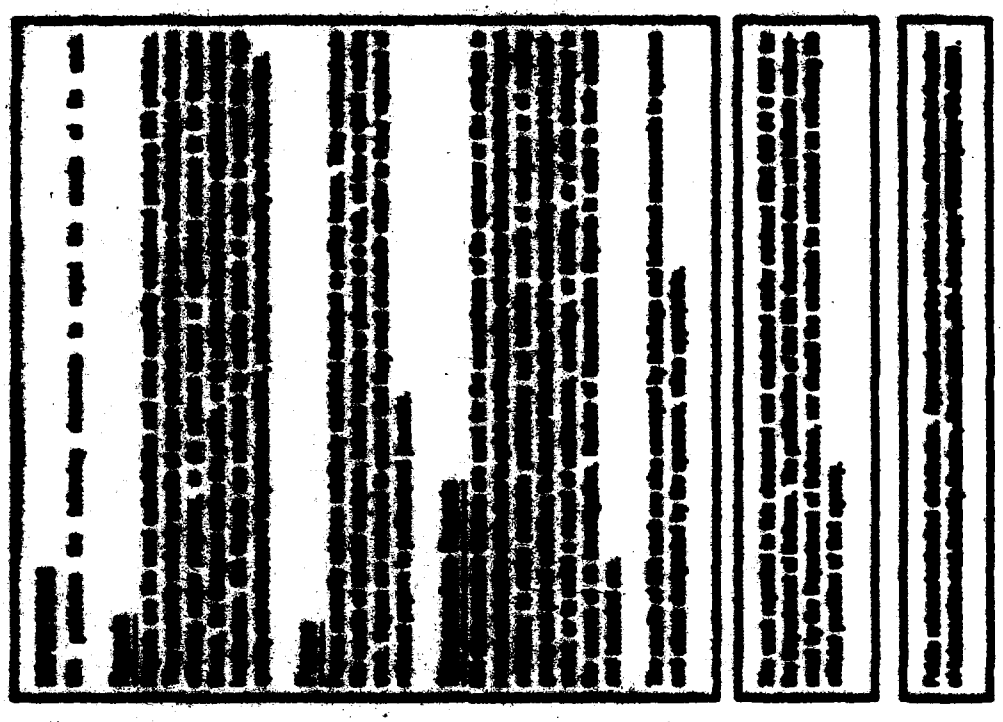

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This briefing report provides (1) a review of Marine Corps fire support requirements and (2) an assessment of the capability of existing and emerging systems to meet, or to be adapted to meet, these requirements. This assessment shows that modifications of FIST DMD, LTACFIRE, and AFATDS can each, to varying degrees, meet Marine Corps fire support requirements. Further, an operational assessment of AFATDS could be conducted by the Marine Corps late in FY89 or early in FY90; to test adaptability, some new software needs to be developed in AFATDS. Finally, if not otherwise directed, the Army and Marine Corps may implement incompatible data communications protocols for BOI standards.

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ASSESSMENT OF ADP FOR USMC FIRE SUPPORT

R. P. Walker, *Project Leader*
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G. A. Corliss

November 1988

INSTITUTE FOR DEFENSE ANALYSES

Contract MDA 903 84 C 0031
Task T-F1-550

PREFACE

(U) This report is submitted in accordance with contract MDA 903 84-C-0031, Task T-F1-550. The objective of this task was to conduct an assessment of Marine Corps fire support requirements and to evaluate the potential of existing and emerging systems to meet, or to be adapted to meet, these requirements.

(U) This task was accomplished by the System Evaluation Division of the Institute for Defense Analyses (IDA). The study team consisted of Dr. Robert P. Walker (Project Leader), LGen Ernest Cheatham (USMC, Ret.), MGen Gregory A. Corliss (USMC, Ret.), Mr. Dudley Kyle, and Dr. Lane B. Scheiber. The study team would like to thank the many people who contributed to and reviewed the results of the study. At the risk of being incomplete, the study team would especially like to thank MGen Edward Bautz (USA, Ret.), Mr. William J. Curry, Dr. Leon L. Delchambre, MGen John L. Gerrity (USA, Ret.), Dr. C. Leslie Golliday, Dr. Richard E. Ivanetich, Dr. Peter S. Liou, Dr. David L. Randall, Dr. Richard E. Schwartz, Dr. Eugene Simaitis, and Col William C. Stephens for their critical reviews, helpful suggestions, and timely assistance.

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INTRODUCTION

(U) In September 1972 the Marine Corps initiated a program called the Marine Integrated Fire and Air Support System (MIFASS). Following an 8-year engineering development phase begun in 1979, this program was terminated in 1987 by the Secretary of the Navy on the recommendation of the Commandant of the Marine Corps. MIFASS was planned to be a modular, semiautomated, near real-time command and control system for integrating the employment of mortars, artillery, naval gunfire, and direct air support assets with the Marine Air Ground Task Force (MAGTF) during an amphibious assault and subsequent operations ashore.

(U) Since 1984, the Army has been developing an Advanced Field Artillery Tactical Data System (AFATDS) to replace an older automation support system for fire support command and control. Initial operational capability (IOC) for AFATDS is now projected to be late in FY92. In the interim, the Army is continuing to use the Tactical Fire Direction System (TACFIRE), together with two new systems for the light divisions: a lightweight version of the battalion TACFIRE and the Fire Support Team (FIST) Digital Message Device (DMD).

(U) Since the termination of MIFASS, the Marine Corps has been reviewing its requirements for fire support automation. A major concern within OSD was whether these requirements would lead to a new development program. Consequently, IDA was tasked[1] by OUSDA/TWP/LW and OASD(C3I)-T&TC3 to evaluate the degree to which existing and emerging fire support systems meet, or can be adapted to meet, these requirements.

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1 (U) In a previous study for OSD, IDA reviewed both MIFASS and AFATDS: *An Independent Assessment of Two Fire Support Systems, AFATDS and MIFASS*, IDA Paper P-1991, January 1987, UNCLASSIFIED.

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OUTLINE

- OBJECTIVES, APPROACH, AND SCHEDULE
- ISSUES
- RESULTS
- CONCLUSIONS AND SUGGESTED COURSES OF ACTION

(U) IDA was tasked by the Office of the Secretary of Defense (OSD) to provide an assessment of the Marine Corps fire support requirements and to evaluate alternatives for adapting existing and emerging systems to meet these requirements. The target attack means associated with the term "fire support" includes artillery, naval gunfire, mortars, and close air support.

(U) The study sponsors are: Office of the Under Secretary of Defense for Acquisition (OUSDA), Tactical Warfare Programs (TWP)/Land Warfare (LW); the Office of the Assistant Secretary of Defense (OASD) for Command, Control, Communications, and Intelligence (C3I), Theater and Tactical Command, Control, and Communications (T&TC3); and the Joint Tactical Command, Control, and Communications Agency (JTC3A). The task order and additional tasking guidance are contained in Appendix C.

(U) At the mid-term program review, the study team identified (1) the need and opportunity for the Marine Corps to conduct an assessment of AFATDS and (2) the need to reach agreement on information exchange standards for fire support between the Army and the Marine Corps. Following this review, additional guidance was provided by the sponsors. This guidance specifically requested a draft concept paper for an early assessment by the Marine Corps of the Army's AFATDS and examination of interoperability issues for bit-oriented information exchange between the Army and the Marine Corps in the fire support area. A copy of the draft concept paper is contained in Appendix A, and the analysis of interoperability issues is included in the main body of this report.

OBJECTIVES

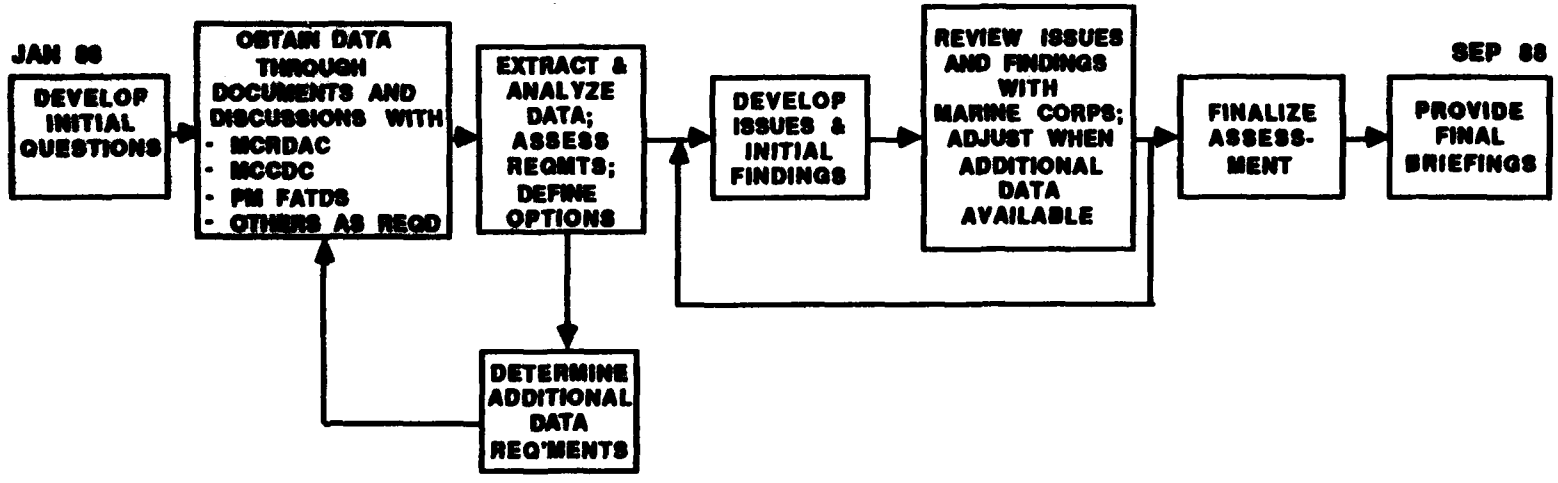
- PROVIDE AN ASSESSMENT OF MARINE CORPS REQUIREMENTS, SYSTEM CONCEPT, DEVELOPMENT APPROACH, AND ACQUISITION PLAN FOR AUTOMATED DATA PROCESSING FOR FIRE SUPPORT

- EVALUATE ALTERNATIVES FOR ADAPTING SYSTEMS (e.g., THE U.S. ARMY'S AFATDS) TO MEET THESE NEEDS

(U) The technical approach for this task includes two cyclic activities, one to obtain and analyze the data, and the other to extract and refine the issues. In both activities, the findings were discussed with the Services and, where appropriate, additional data were requested and incorporated. The final program briefing was provided on 29 September 1988. The data in this report are considered current as of 20 September 1988.

(U) Frequent visits and numerous discussions were held with personnel from the Marine Corps Research, Development, and Acquisition Command (MCRDAC), especially the Program Manager for Ground Command and Control, the Program Manager for Communications and Navigation, and the Systems Integration Directorate; the Marine Corps Combat Development Command (MCCDC); the C4 Systems Division at Headquarters, Marine Corps (HQMC); U.S. Army Program Manager for Field Artillery Tactical Data Systems (PM FATDS); Joint Tactical C3 Agency (JTC3A), U.S. Army C4 Division, Center for Naval Analyses, Litton Data Systems, and Magnavox Electronic Systems Company. Additionally, IDA visited the Marine Corps Tactical Systems Support Activity (MCTSSA), I Marine Expeditionary Force (I MEF), 1st Marine Division (1st MARDIV), Marine Corps Air Ground Combat Center (MCAGCC), Marine Corps Operational Test and Evaluation Agency (MCOTEA), the U.S. Army Operational Test and Evaluation Agency (OTEA), the Program Executive Officer (PEO) Command and Control Systems (CCS), and the USMC Deputy Chief of Staff for Research, Development, and Studies (RD&S). Participants from the U.S. Army TRADOC System Manager Fire Support C3, U.S. Army Field Artillery Board, the C3 Joint Staff (J-6), the Center for Naval Analyses, and several Marine Corps operational units have also been included in technical discussions.

APPROACH AND SCHEDULE



(U) From a wide range of issues identified during the course of the study, four issues were highlighted as fundamental. The first is identification of those fire support requirements that appear to drive the attainment of a near-term capability. This issue has been especially important because, when the task was begun in January 1988, the Marine Corps had not yet developed a new statement of requirements for fire support since the MIFASS Required Operational Capability (ROC) was approved in 1979.

(U) The second issue focuses on the evaluation of systems, whether fielded or still in development, that could meet the major (driving) fire support requirements. In some cases, modifications of existing and emerging systems have been defined, and these were also evaluated.

(U) The third issue addresses the acquisition planning process. Specifically, it focuses on how soon the system candidates could be evaluated and what acquisition milestone decisions these evaluations could support. The issue implicitly raises questions about what are the alternative courses of action, what are the potential impacts of various research and development decisions, and what options appear most advantageous to keep open during the next few years.

(U) Issues associated with *intraoperability* (among Marine Corps systems) and interoperability (between the Army and the Marine Corps) were identified early in the analysis. As a result of questions raised during a mid-term briefing, IDA was tasked to explore these issues in some depth and to focus, as shown in the fourth issue, on the potential for improving interoperability between the Army and the Marine Corps in the fire support functional area.

ISSUES

- WHAT ARE THE DRIVING REQUIREMENTS FOR AUTOMATING FUNCTIONS FOR MARINE CORPS FIRE SUPPORT?
- CAN EXISTING OR EMERGING SYSTEMS MEET OR BE ADAPTED TO MEET THESE REQUIREMENTS?
- HOW SOON COULD SYSTEM CANDIDATES BE EVALUATED FOR ACQUISITION DECISIONS?
- HOW CAN ARMY/MARINE CORPS INTEROPERABILITY BE IMPROVED?

(U) The main body of this report is a summary of the results of the analyses performed in this study. A review of Marine Corps fire support requirements is followed by evaluation of system options and presentation of a potential acquisition milestone schedule. Opportunities for further cooperation between the Marine Corps and the Army are discussed, in which the opportunity for the Marine Corps to conduct an early assessment of AFATDS is highlighted. Finally, interoperability issues are discussed, with a focus on the progress and additional work needed to specify information exchange standards for fire support between the Army and the Marine Corps.

RESULTS

- **REQUIREMENTS**
- **EVALUATION OF SYSTEM OPTIONS**
- **POTENTIAL ACQUISITION MILESTONE SCHEDULE**
- **OPPORTUNITIES**
- **INTEROPERABILITY ISSUES**

(U) The initial data collection phase of the analysis was devoted to identifying fire support requirements that appeared to be essential to an initial capability and would have to be provided early in the fielding of a fire support command and control system. Such requirements were termed "driving" requirements and are summarized on this chart. The study team reviewed the briefings of the Marine Corps Requirements Working Group, the MIFASS ROC, after-action reports on lessons learned from MIFASS, and various concept papers. No new ROC has yet been approved by the Marine Corps to replace the 1979 MIFASS ROC.

(U) Fire support requirements are traditionally grouped in the three areas of technical fire direction, tactical fire direction, and fire support coordination. Technical fire direction provides direction to each gun for ammunition, charge, azimuth, elevation, and other parameters needed for fire commands at the battery level. Tactical fire direction guides the selection of firing units for each target and the number and type of rounds to be used. Fire support coordination identifies and prioritizes potential targets, develops fire plans, selects targets to be engaged, and coordinates and integrates the use of various fire support means with the Commander's intent.

(U) Initially, the Marine Corps plans to support technical fire direction with the Battery Computer System (BCS, AN/GYK-29) now being fielded. The previously fielded Backup Computer System (BUCS), using a commercial hand-held calculator with plug-in modules, will continue to be used for technical fire direction.

(U) Only a limited degree of automation is reflected in the requirements for tactical fire direction and fire support coordination. The key requirements for tactical fire direction include assignment of artillery units to targets and target attack analysis. Fire support coordination includes mission status reporting, message handling, position location information (PLI) handling, and situation display (graphics).

(U) A more detailed statement of the key fire support requirements will be provided in the next section on evaluation of system options.

SUMMARY OF EMERGING REQUIREMENTS THAT ARE DRIVING EARLY EVALUATION OF SYSTEM OPTIONS

TECHNICAL FIRE DIRECTION:

- AS PROVIDED BY BATTERY COMPUTER SYSTEM

TACTICAL FIRE DIRECTION:

- SUPPORT TACTICAL FIRE DIRECTION
- SUPPORT MARINE TACTICAL SYSTEM (MTS) & TACFIRE PROTOCOLS
- STORE, REVISE, DISPLAY & PRINT TARGET LIST & LISTS OF TARGETS

FIRE SUPPORT COORDINATION:

- PROVIDE FIRE AND AIR MISSION STATUS
- RECORD AND DISTRIBUTE COMMANDER'S INTENT AND PLANS FOR MANEUVER & FIRE SUPPORT
- SUPPORT MESSAGE PREPARATION, DISTRIBUTION & PRINTING
- PROVIDE PLI (e.g., PLRS INTERFACE) TO FSCCs, COCs, DASC, FDCs, FOs & FACs
- PROVIDE GRAPHIC DISPLAY OF MANEUVER & FIRE PLANS, AS WELL AS INTELLIGENCE INFORMATION (ENEMY SITUATION)

(U) While the requirements summarized on the preceding chart were derived from sources other than a new fire support ROC, the Marine Corps has now promulgated a draft ROC for a Flexible Fire Support Coordination System (FIREFLEX).[2] FIREFLEX is based on: (1) the need to provide tactical control of fielded or planned-to-be-fielded digital fire support systems in the Marine Corps and (2) the required management of associated digital communications nets. The ROC identifies the IOC as 4Q FY92 and the full operational capability in 3Q FY94.

(U) The ROC places a major emphasis on digital message management. Indeed, half of the 34 primary required characteristics address capabilities for message handling, net management, and communications interfaces.

(U) Most but not all of the key or driving requirements identified by the study team are specifically mandated for FIREFLEX by this ROC. Exceptions are JINTACCS Message Text Format exchange (not yet incorporated in any Marine Corps or Army fire support system--the Marine Corps and the Army plan to use bit-oriented JINTACCS messages for future interoperability); receipt and transmission of maneuver plans (these may be included in a tactical situation display); and display of planned or real-time air tracks (specified as preplanned product improvement).

(U) FIREFLEX is planned to be acquired through evolutionary development. It is a near-term system with a limited requirement for automation. It is planned to provide, as stated in the ROC, a "technological building block to an objective system. This will permit the Marine Corps to incrementally incorporate automation into its command and control system." While terminals are specified for the Tactical Air Command Center (TACC) and the Direct Air Support Center (DASC), the draft ROC, however, does not specify functionality for integrating air support, nor does it address intraoperability with key Marine Corps systems such as the Tactical Air Operations Module (TAOM) and the Advanced Tactical Air Command Center (ATACC).

(U) MCCDC has plans to develop a system requirements document for increased integration of fire and maneuver--this concept will be called FIREMAN, and FIREFLEX will be a part of FIREMAN.

---

2 (U) *Required Operational Capability (ROC) for a Marine Flexible Fire Support Coordination System (FIREFLEX)*, Draft, July 1988, UNCLASSIFIED.

REQUIREMENTS

- A FIRE SUPPORT ROC (FIREFLEX) THAT FOCUSES ON NEAR-TERM CAPABILITY HAS BEEN DRAFTED
- CAPABILITY FOR DIGITAL MESSAGE MANAGEMENT IS A MAJOR NEAR-TERM PRIORITY FOR MARINE CORPS FIRE SUPPORT
- OBJECTIVE FIRE SUPPORT REQUIREMENTS, SUCH AS AUTOMATING AIR SUPPORT INTEGRATION AND INTRA-OPERABILITY WITH OTHER MARINE CORPS C2 SYSTEMS (E.G., TAOM), STILL NEED TO BE ADDRESSED
- MARINE CORPS PLANS TO DEVELOP A CAPSTONE REQUIREMENTS DOCUMENT FOR INCREASED INTEGRATION OF FIRE AND MANEUVER (FIREMAN)

(U) Evaluation of system options begins by identifying the baseline and emerging systems. This is followed by a chart that identifies how the baseline systems are fielded to Marine Corps command elements at various echelons. Two charts are then presented that provide a detailed statement of near-term requirements and identify the degree to which systems and systems with modifications could meet these requirements. Using the most capable systems as building blocks, the final chart identifies some alternative courses of action.

RESULTS

- REQUIREMENTS
- EVALUATION OF SYSTEM OPTIONS
- POTENTIAL ACQUISITION MILESTONE SCHEDULE
- OPPORTUNITIES
- INTEROPERABILITY ISSUES

(U) Four fire support systems are now in use by the Marine Corps: BCS, AN/TPQ-36 FIREFINDER Radar (Q-36), Meteorological Data System (MDS, AN/TMQ-31), and BUCS. The Q-36 is a counter-mortar radar with capability for counter-battery target acquisition. BCS, Q-36, and MDS are designed to interoperate with a TACFIRE computer and can only support TACFIRE-unique messages. Using tactical radios that are properly calibrated, the Q-36 and MDS can interface directly with BCS.

(U) Additional capability is fielded that supports both fire support and maneuver. The Digital Communications Terminal (DCT, AN/PSC-2) is a hand-held digital input-output device with a single modem capable of transmitting up to 16,000 bits per second. Separate software loads are provided for reconnaissance/intelligence, air support, and fire support messages. The DCT is designed to use Marine Tactical System (MTS) bit-oriented messages and protocols; however new software is being developed for the DCT by the Army for exchanging TACFIRE messages. The Position Location Reporting System (PLRS, AN/USQ-90) provides real-time position and navigational information and limited digital UHF communications. Additionally, commercial and ruggedized personal computers (PCs), with off-the-shelf and Fleet Marine Force (FMF)-developed software, are being used in several Marine Corps divisions primarily for message management.

(U) The Army plans to field three fire support systems during the next few years: FIST DMD (AN/PSG-5, IOC 2Q FY89), Lightweight Tactical Fire Direction System (LTACFIRE, AN/PYC-1, IOC 1Q FY90), and AFATDS (IOC 4Q FY92). These systems each support TACFIRE-compatible character-oriented messages and protocols. U.S. Army TRADOC is developing modifications to the ROC for FIST DMD, and the Marine Corps has initiated some early hardware modifications and software development ($400,000 in FY88). LTACFIRE[3] is being fielded, along with FIST DMD, to seven Army light divisions under Congressional mandate. Litton Data Systems has begun an internal research and development activity to modify LTACFIRE for Marine Corps employment. The initial development phase for AFATDS is being completed by Magnavox, and the Concept Evaluation for AFATDS at Fort Sill is planned for March - April 1989. Almost all of the 1,200,000 lines of code for AFATDS is written in Ada. The AFATDS Block 1 development phase in FY90-FY92 will include porting AFATDS concept evaluation software to the Army Tactical Command and Control System (ATCCS) common hardware, developing additional functions to provide comparability with the TACFIRE capability, and conducting operational tests.

(U) Two versions of AFATDS with modifications (AFATDS MOD) are considered as system options in charts that follow. One would add some Marine Corps-unique functions and the other, a Marine Corps version of AFATDS (MAFATDS), would use the AFATDS modules but have Marine Corps-unique user interfaces.

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3 (U) As discussed in this report, LTACFIRE denotes the Briefcase Terminal (BCT); LTACFIRE does not include a TACFIRE Division Artillery (DivArty) capability or an L3212 emulator for DivArty.

BASELINE AND EMERGING SYSTEMS

- **Baseline Capabilities (Fire Support and Maneuver)**
  - BCS (Battery Computer System)
  - Q-36 (FIREFINDER Radar)
  - MDS (Meteorological Data System)
  - BUCS (Backup Computer System)
  - DCT (Digital Communications Terminal)
  - PLRS (Position Location Reporting System)
  - Personal computers (PCs) and off-the-shelf software
  - FMF software initiatives
- **Emerging Fire Support Systems**
  - FIST DMD (Fire Support Team Digital Message Device); IOC 2QFY89
  - FIST DMD with modifications (FIST DMD MOD)
  - LTACFIRE (Lightweight Tactical Fire Direction System); IOC 1Q FY90
  - LTACFIRE with modifications (LTACFIRE MOD)
  - AFATDS (Advanced Field Artillery Tactical Data System); IOC 4Q FY92
  - AFATDS with modifications (AFATDS MOD)

(U) The baseline systems identified in the previous chart are in selected use at all echelons, including the MEF, Division (DIV), Regiment (REGT), Battalion (BN), Battery (BTRY), and Company (CO), as well as by naval gunfire (NGF) spotters, forward air controllers (FACs), and forward observers (FOs). Operational facilities include the Combat Operations Centers (COCs, not shown on the chart), Supporting Arms Special Staff (SASS), the shipboard Supporting Arms Coordination Center (SACC), Fire Support Coordination Centers (FSCCs), the division-level Direct Air Support Center (DASC), and Fire Direction Centers (FDCs).

(U) The baseline systems provide support for digital message entry (DCT), target acquisition (Q-36), meteorological data (MDS), technical fire direction (BCS, BUCS), and position location/navigation data (PLRS). However, with the termination of MIFASS, there is no digital message management capability or automated support to perform the fire support coordination functions at FSCCs, nor a capability to perform tactical fire direction functions. There is no fire support automation at mortar FDCs (the Marine Corps did not procure the Mortar Ballistics Computer fielded by the Army).

(U) The Army is developing fire support messages for the DCT that are compatible with TACFIRE and the BCS. However, the DCT systems loaded with Marine Corps-developed software for NGF spotters, FACs, and intelligence personnel are not compatible with BCS.[4] DCTs with Army-developed software, the Q-36, and the MDS can be directly connected to a BCS, but the BCS does not have a capability to relay call-for-fire, meteorological, or target acquisition messages to other BCSs.

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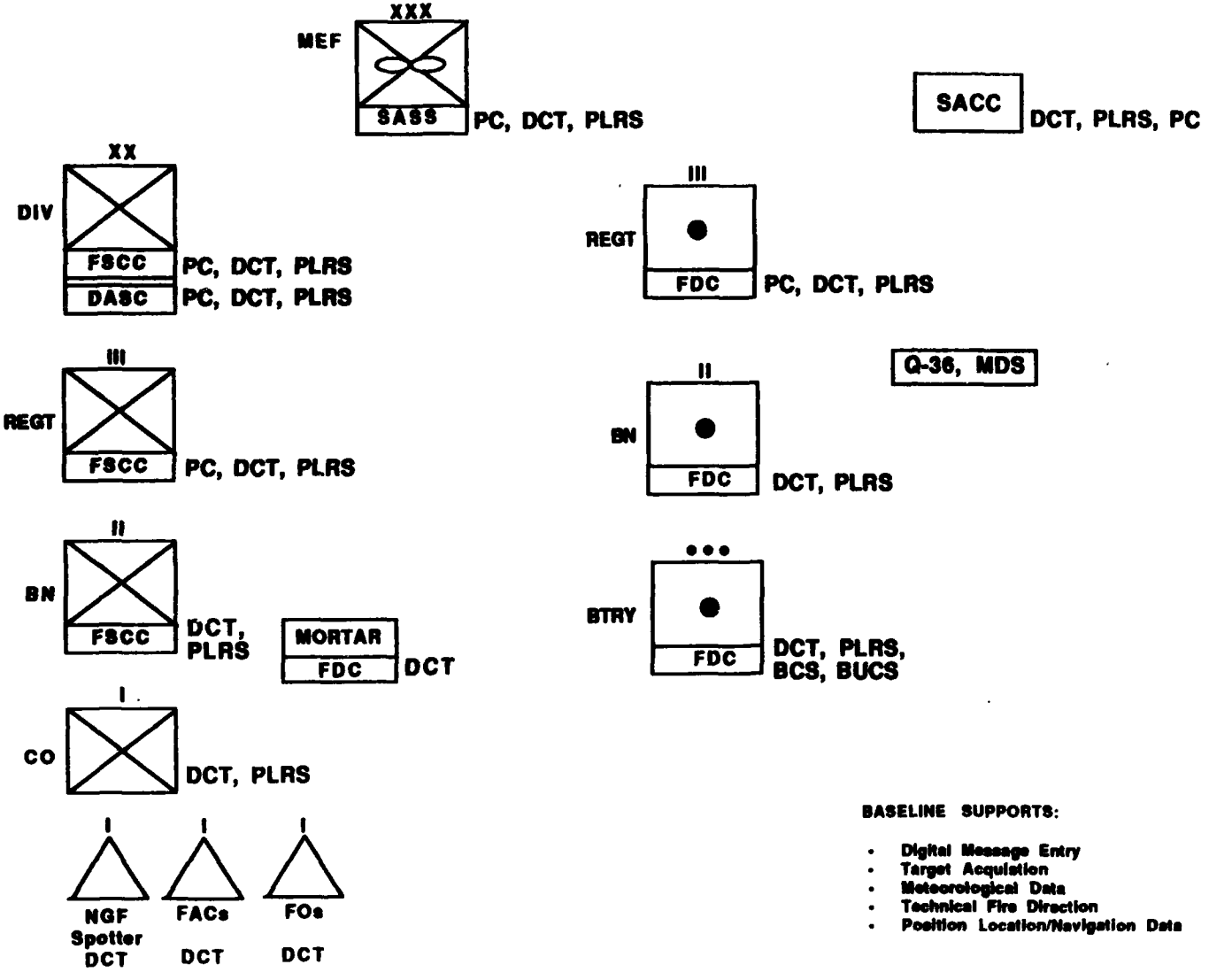
4 (U) *Interoperability between TACFIRE-based systems such as BCS and MTS-based systems for forward elements was to have been provided by MIFASS.*

BASELINE SYSTEMS



BASELINE SUPPORTS:

- Digital Message Entry
- Target Acquisition
- Meteorological Data
- Technical Fire Direction
- Position Location/Navigation Data

(U) This and the following chart summarize the results of an evaluation of the ability of various system options to meet the near-term "driving" Marine Corps fire support requirements. The two charts identify 12 requirements, of which three (e.g., Requirement 4) have several parts. Based on a number of discussions with personnel from MCCDC and MCRDAC, an example priority was assigned to each requirement. Priority 1 indicates that the requirement must be met by an initial capability, and priority 2 indicates a requirement that could be deferred to a modification or a preplanned product improvement (P3I) after IOC. These priorities are still under discussion within the Marine Corps, and for at least two of the requirements there is substantial disagreement (highlighted by use of a question mark with the alternative priority). Whether the MTS protocols must be implemented by IOC in a fire support system could have significant impact on system options. Software for these protocols is being developed for LTACFIRE MOD and could be developed for FIST DMD MOD and AFATDS MODs if the work is begun soon (MTS protocols are not currently planned for FIST DMD MOD). (While the draft ROC does not prioritize interface requirements, HQMC C4 Division is a strong proponent for requiring MTS protocols in any IOC FIREFLEX system.)

(U) An open circle is used to identify systems that meet the requirement. A solid circle identifies systems that do not meet priority 1 requirements. A shaded circle identifies the other cases: the system only partially meets the requirement or does not meet a priority 2 requirement. Systems with one or more solid circles (FIST DMD) appear not to be suitable candidates for fire support command and control.

(U) It should be emphasized that the chart is not designed to measure the differences between the system options.[5] For example, FIST DMD MOD and LTACFIRE are both shown to meet the minimum tactical fire direction requirements (Requirement 1), but these two systems are by no means equivalent in their overall capability to support tactical fire direction--LTACFIRE is roughly equivalent to the Battalion TACFIRE for technical fire direction and provides many more types of functional support in this area than does FIST DMD MOD. AFATDS is also shown to meet Requirement 1, but AFATDS will provide functions (e.g., target value analysis) not available in either FIST DMD MOD or LTACFIRE.

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5 (U) A table listing the full range of fire support functions provided by TACFIRE, AFATDS, and MIFASS is provided in Reference 1.

EVALUATIONS[1]

NEAR-TERM REQUIREMENTS		EMERGING FIRE SUPPORT SYSTEMS						
STATEMENT OF REQUIREMENT	EXAMPLE PRIORITY	FIST DMD	FIST DMD MOD	LTACFIRE	LTACFIRE MOD	AFATDS (BLK 1)	AFATDS WITH MC FNCTNS	MAFATDS
1. Support Tactical Fire Direction (to include assignment of artillery units to targets and target attack analysis)	1	●	O	O	O	O	O	O
2. Provide TACFIRE-Protocol Interfaces to BCS, AN/TPQ-36, and MDS	1	O	O	O	O	O	O	O
3. Provide MTS-Protocol Interfaces to DCT and ULTDS	2 (1?)	●	●	●	O	●	●	O
4. Store, Revise, Display, and Print the Target List	1	●	O	O	O	O	O	O
a. Manage at Least 200 Targets	2	●	O	O	O	O	O	O
b. Support Other Lists of Targets	2	●	●	O	O	O	O	O
5. Report Fire and Air Mission Status	1	●	O	O	O	O	O	O
6. Provide Message Preparation, Distribution, and Printing (to include Air Tasking Order & Target List)	1	●	O	O	O	O	O	O

[1] BASED ON EARLY ESTIMATES OF THE CAPABILITIES PROVIDED AT TIME OF INITIAL FIELDING

KEY
O Meets requirement
● Does not meet priority 1 requirement
● Partially meets requirement or does not meet priority 2 requirement

(U) Interface with PLRS is called out as a FIREFLEX requirement in the draft ROC, but, as for MTS protocols, the requirement (7a) is shown as priority 2 in this evaluation chart. This reflects the view that manual input of position data provided from PLRS units could be satisfactory at IOC for a Marine Corps fire support system. An initial capability for the PLRS interface could provide for display of locations or tracks from selected user units (Requirement 8a). There is no requirement for the fully automated receipt and distribution of all PLRS data, as was the case for MIFASS.

(U) The draft FIREFLEX ROC calls for a high degree of ruggedization (Requirement 11). Specifically, "be operable in all combat/environmental conditions to include, but not be limited to, smoke, dust, rain, fog, NBC (nuclear survivability is desired but not required), salt water or any combination of these conditions. Required operating temperature range is -25 degrees F to 125 degrees F." TEMPEST and operability from a vehicle are also specified. FIST DMD has been tested to MILSPECs and LTACFIRE is military specification (MILSPEC) designed. However, the common hardware being procured for ATCCS is ruggedized but not MILSPEC. Unless the FIREFLEX ruggedization requirements are reduced, the Marine Corps may not be able to field AFATDS using the Army's common hardware.

(U) The assessments of nonfielded systems (i.e., other than the current versions of FIST DMD and LTACFIRE) shown in this and the previous chart are based on development plans that are subject to change. Many of the deficiencies shown in the chart (e.g., availability of MTS protocols in FIST DMD MOD and AFATDS Block 1) can be corrected by increasing or redirecting planned evolutionary development of the systems. Based on the data available in September 1988, this analysis shows that modifications of FIST DMD, LTACFIRE, and AFATDS each could meet, at least in part, stated near-term Marine Corps fire support requirements. Therefore, it does not appear necessary for the Marine Corps to begin a new development program to meet the FIREFLEX ROC. Without modifications, FIST DMD would not address critical fire support requirements, but if a decision to develop and procure FIST DMD MODs were made, procurement of FIST DMD in limited numbers would address the requirements for improved fire support digital message management. FIST DMD MOD would be a limited solution to a number of requirements and may not therefore be a suitable long-term candidate for an objective system, even with evolutionary development. Both LTACFIRE and AFATDS could be used for evolutionary development.[6]

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6 (U) An overall assessment of advantages and disadvantages of LTACFIRE and AFATDS was outside the scope of this task.

EVALUATIONS (CONT'D)

NEAR-TERM REQUIREMENTS (Cont'd)		EMERGING FIRE SUPPORT SYSTEMS						
STATEMENT OF REQUIREMENT	EXAMPLE PRIORITY	FIST DMD	FIST DMD MOD	LTACFIRE	LTACFIRE MOD	AFATDS (BLK 1)	AFATDS WITH MC FNCTNS	MAFATDS
7. Provide Position Location Information (PLI) to FSCCs, COCs, DASC, FDCs, FOs, and FACs	1	○	○	○	○	○	○	○
a. Provide PLRS Interface	2 (1?)	●	●	●	●	●	○	○
8. Provide Graphical Display of Maneuver&Fire Plan, and Info on Intel (enemy situation)	1	●	●	○	○	○	○	○
a. Planned Air Tracks and Routing	1	●	●	○	○	○	○	○
b. Real-Time Air Tracks for Helos	2	●	●	●	●	●	●	○
c. Transmit Graphical Displays	2	○	○	○	○	○	○	○
9. Record and Distribute Cdr's Intent and Plans for Maneuver and Fire Support	1	●	○	○	○	○	○	○
10. Exchange Critical Elements of Information with Other Fire Support C2IE Elements	1	●	●	●	●	○	○	○
11. Provide a High Degree of Ruggedization	1	○	○	○	○	●	●	●
12. Provide JINTACCS MTF Message Exchange	2	●	●	●	●	●	○	○

CONCLUSION: BASED ON PROPOSED DEVELOPMENT PLANS, MODIFICATIONS OF FIST DMD, LTACFIRE, AND AFATDS EACH COULD MEET, AT LEAST PARTIALLY, STATED NEAR-TERM FIRE SUPPORT REQUIREMENTS

(U) The systems evaluated in the previous charts may be viewed as building blocks for an evolutionary development strategy for FIREFLEX. The chart shows the three most suitable options, where AFATDS MOD could be AFATDS modified with the addition of selected Marine Corps functions or could be AFATDS redesigned (using the same software modules) and augmented with new functions. The chart presumes that a number of the software initiatives being developed in the FMF will continue and that some would be considered part of the fire support system, even if they were implemented on stand-alone hardware.

(U) The chart depicts four of the many possible courses of action. Each of these has support in the Marine Corps, but none has yet been adopted or given preference as part of an overall acquisition strategy. One course of action would be to make no new development or procurement decision, relying on FMF initiatives and continuing the current manual support to most fire support functions other than technical fire direction. The other courses of action each include FIST DMD MOD, primarily because its size, weight, cost, ruggedness (MILSPEC), and support to digital message management make it an attractive option for battalion FSCCs, even if LTACFIRE or AFATDS is also procured. Thus, a key question for determining which courses of action are really appropriate is whether, in fact, FIST DMD MOD should be included in the acquisition strategy. If the suggestion made in the chart is valid, that FIST DMD MOD might be a part of any acquisition strategy, then the decision on FIST DMD MOD might be decoupled from decisions on LTACFIRE and AFATDS.

POTENTIAL COURSES OF ACTION

BASELINE UPGRADES

- FMF INITIATIVES

BUILDING BLOCKS FOR NEW SYSTEM OPTIONS

- FIST DMD MOD
- LTACFIRE MOD
- AFATDS MOD

SOME POTENTIAL COURSES OF ACTION:

1. FMF INITIATIVES
2. FMF INITIATIVES + FIST DMD MOD
3. FMF INITIATIVES + FIST DMD MOD + LTACFIRE MOD
4. FMF INITIATIVES + FIST DMD MOD + AFATDS MOD

CONCLUSION: A KEY QUESTION FOR DETERMINING COURSES OF ACTION IS WHETHER FIST DMD MODIFICATIONS SHOULD BE INCLUDED.

(U) This section of the study results presents a potential acquisition milestone schedule. More detailed potential acquisition roadmaps are provided in Appendix B.

(U) All the options in the chart that follows assume that the Marine Corps is using its fire support research and development funds to evaluate and modify where necessary existing or emerging Army systems, since these systems, with modifications and to varying degrees, have been found to meet Marine Corps fire support requirements.

RESULTS

- REQUIREMENTS
- EVALUATION OF SYSTEM OPTIONS
- **POTENTIAL ACQUISITION MILESTONE SCHEDULE**
- OPPORTUNITIES
- INTEROPERABILITY ISSUES

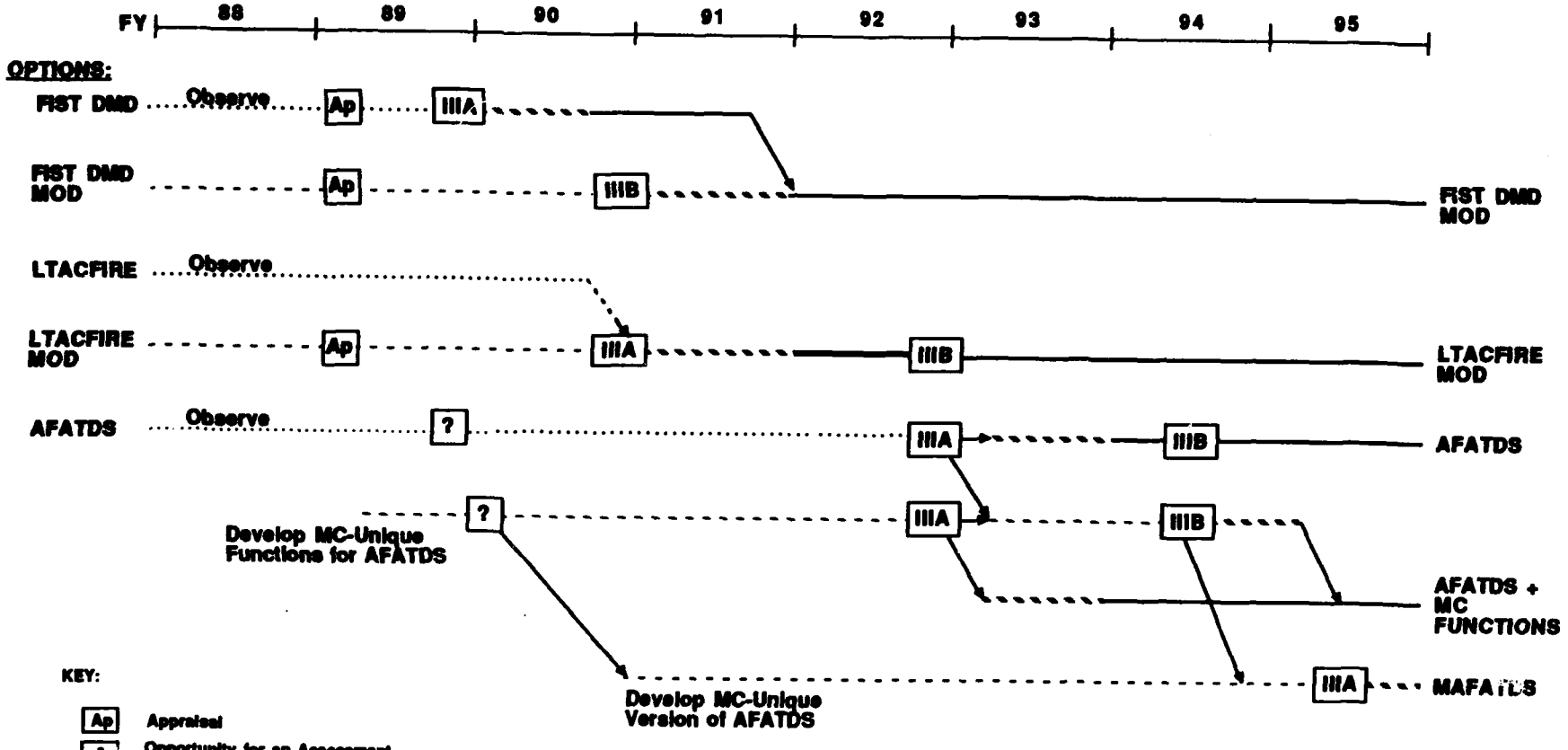
(U) The potential acquisition milestone schedule shown in this chart identifies some activities already initiated by the Marine Corps (e.g., observing Army programs, modifying FIST DMD), some planned efforts (e.g., conducting appraisals of FIST DMD, FIST DMD MOD, and LTACFIRE MOD), and some opportunities not yet planned (e.g., developing functions for AFATDS modifications, assessing AFATDS [identified with "?"]). Development of modifications to LTACFIRE are in progress, funded by the contractor. Operational tests are associated with Milestone III decisions, but these are not shown.

(U) The milestones shown on this chart were developed by the study team to reflect the earliest time a procurement decision could be recommended. In each case, a Milestone IIIA is a limited production decision for fielding to the infantry regiment and associated fire support units of a Marine Expeditionary Brigade (MEB). The Milestone IIIA does not imply a commitment to Milestone IIIB, a full production procurement decision. Milestone IIIA could be planned for FIST DMD provided that FY89 appraisals showed that FIST DMD MOD would be suitable, when complete, for fielding. Milestone IIIB for FIST DMD MOD and Milestone IIIA for LTACFIRE are constrained in the schedule by a recommendation to wait until the Army has completed a formal qualification test (FQT) of AFATDS Concept Evaluation software integrated into ATCCS common hardware (4Q FY90). At that time, MOD FIST DMD and LTACFIRE MOD developments would be complete and additional assessments and operational tests could have been completed. Specifically, the Marine Corps could have enough information in hand to determine: (1) if FIST DMD MOD would be part of any objective solution, (2) how urgent are the requirements not met by FIST DMD MOD, and (3) whether the status of the AFATDS program warrants going ahead with LTACFIRE for the early 1990s.

(U) The main observations from the chart are: (1) that FIST DMD MOD and LTACFIRE MOD could be available (initially fielded) by the end of FY91; (2) that early appraisals of FIST DMD MOD and LTACFIRE MOD have already been planned (FY89); and (3) that there were, at the time of this analysis, no firm Marine Corps plans for assessing AFATDS, but that an assessment of AFATDS is needed in FY89 or early in FY90 to provide a basis for acquisition milestone decisions.

POTENTIAL ACQUISITION MILESTONE SCHEDULE

(MORE THAN ONE OPTION IN OUT YEARS MAY BE DESIRABLE)



OBSERVATIONS:

- FIST DMD MOD and LTACFIRE MOD could be available in FY91
- Appraisals of FIST DMD MOD and LTACFIRE MOD are already planned
- Marine Corps assessment of AFATDS is needed in FY89 or FY90

(U) This section describes some of the opportunities that have been discussed with the Marine Corps and the Army during the course of this study that would enlarge the scope of cooperation between the two Services regarding fire support area. Additional details on such opportunities are provided in Appendix B.

RESULTS

- REQUIREMENTS
- EVALUATION OF SYSTEM OPTIONS
- POTENTIAL ACQUISITION MILESTONE SCHEDULE
- OPPORTUNITIES
- INTEROPERABILITY ISSUES

(U) The Marine Corps and the Army have been cooperating in the fire support area for many years. Fire support personnel from the two Services receive essentially the same training at Fort Sill. Marines have participated in early revisions of the Army's Red Book[7] of fire support user requirements and have been observing tests and demonstrations of Army systems. The Marines attended Government-witnessed AFATDS tests in FY88 and will provide three officers for training and participation in the AFATDS Concept Evaluation in March and April 1989. Marine liaison with the Army's PM FATDS at Ft. Monmouth is being explored. Further, the Marine Corps has fielded Q-36, BCS, and MDS, and it has prepared appraisal plans for two other Army fire support systems, FIST DMD and LTACFIRE.

(U) As indicated in the previous chart, there is an opportunity for the Marine Corps to assess AFATDS soon after the Army's Concept Evaluation. Because of commitments at Fort Sill to analyze the Concept Evaluation data, prepare test reports, and support scheduled tests of other fire support systems (e.g., the Howitzer Improvement Program), the facilities and AFATDS equipment at Fort Sill would not be available until September 1989. Thus, the assessment opportunity would be late in FY89 or early in FY90.

(U) IDA was given additional tasking during the course of this study to explore the concept of a Marine Corps operational assessment of AFATDS. A concept paper has been prepared and is included as Appendix A. The remaining charts in this section describe this assessment concept.

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7 (U) *Fire Support Functional Definition (Red Book)*, Version II, TSM Fire Support C3, 28 October 1988, UNCLASSIFIED.

OPPORTUNITIES

- **MARINE CORPS HAS ALREADY BEGUN EFFORTS TO INCREASE DEGREE OF COOPERATION WITH ARMY**
  - Participating in early revisions of "Red Book" (user requirements)
  - Exploring USMC liaison with PM FATDS
  - Participating in AFATDS Concept Evaluation
  - Appraising recently procured Army systems: FIST DMD and LTACFIRE
- **AN OPPORTUNITY NEEDS TO BE EXPLORED FOR THE MARINE CORPS TO CONDUCT AN "OPERATIONAL ASSESSMENT" OF AFATDS IN LATE FY89 OR EARLY FY90**

(U) The notion of an operational assessment used in this study is an evaluation of a developmental concept to predict its potential to meet operational requirements. Thus, an operational assessment in this context is an extension of a concept evaluation. The term "operational" is used to connote the need to address some, but not all, or even a majority, of the planned operational requirements. The operational assessment of MIFASS conducted by MCOTEA in FY87 was of far greater scope than is intended here.

(U) The key attribute of the assessment concept is the intent to look at the potential of a system concept or system candidate for meeting requirements. This is critical to an evolutionary development approach. Further, assessments with limited scope can be conducted earlier, at less cost, and with fewer personnel than operational tests. Results of such an assessment can be used in the research and development phase of system acquisition to evaluate achievements, predict benefits, and focus further activities by setting priorities and narrowing choices.

(U) An operational assessment can be used by MCCDC and other requirements developers as opportunities to identify, prioritize, and refine requirements. For example, the draft FIREFLEX ROC identifies a large number of required interfaces, some with systems that have not yet completed development (AFATDS) and others with systems that have been developed but not yet fielded (ULTDS, LTACFIRE). Prioritizing interface requirements and providing goals for incremental development in P3I would clarify some of the acquisition issues now being addressed by the Marine Corps.

(U) While the following charts describe the concept of an operational assessment of AFATDS in FY89 or FY90, it would be appropriate to develop a similar concept for an operational assessment of other systems (e.g., LTACFIRE MOD) prior to a major development or limited procurement decision. An operational test should be planned prior to a Milestone IIIB decision.

OPERATIONAL ASSESSMENT

Definition: Evaluation of a developmental concept to predict its potential to meet operational requirements

- **Can be conducted earlier, at less cost, and with fewer personnel than operational tests**
- **Can be conducted in laboratory rather than field environments, using realistic manual/automated simulations**
- **Can be used to predict the real benefit of a developmental system prior to completion of RDT&E**
- **Can be a cost effective means to examine system options for setting development priorities and narrowing choices**
- **Provides an opportunity to identify and refine requirements**

(U) An operational assessment of AFATDS should evaluate the flexibility and adaptability of AFATDS to meet not only current but future fire support requirements. Prior to FY92, the only version of AFATDS software that can be evaluated is the Concept Evaluation version now undergoing formal qualifications testing. While some of the AFATDS hardware has been selected (as part of the ATCCS common hardware and software procurement), some elements (e.g., medium-screen display) have not yet been identified and integration of software to this hardware will not be qualified until the end of FY90, at the earliest. Many of the user interfaces are expected to be modified and some functions expanded in Block 1 software to be tested for IOC in 4Q FY92. Thus, the focus of an early AFATDS operational assessment should be on functionality.

(U) The most mature of the AFATDS functions, as well as the ones most common between the two Services, are those supporting fire support execution. These functions should be the focus of the proposed Marine Corps assessment. The chart shows this and other groups of functions (e.g., incorporating commander's guidance, fire support planning, fire support coordination) in order of suggested priority for the initial assessment. Functions at the bottom of the list are viewed as those for which the emphasis should be on refining the Marine Corps requirements rather than judging how well the current implementation suits the Marine Corps.

POTENTIAL OBJECTIVES FOR AFATDS OPERATIONAL ASSSESSMENT

- **Evaluate the flexibility and adaptability of AFATDS to meet Marine Corps current and future requirements with respect to:**
  - *Fire support execution*
  - Incorporating Commander's guidance
  - Fire support planning
  - Fire support coordination
  - Maneuver control planning
  - Continuity of operations
  - Processing Marine Corps-unique messages

(U) An AFATDS operational assessment for the Marine Corps could use the Concept Evaluation (CE) version of AFATDS software without modifications. However, the assessment could revise or replace the scenario with one used by the Marine Corps in other appraisals and tests, such as a NATO Northern Region scenario. A revised or new Time-Ordered Event List (TOEL) could be developed that provides all the messages, system stimulation, and planned external responses required to conduct a test. This TOEL could be exercised manually, as with many other Marine Corps evaluations. Alternatively, it could be exercised automatically or semi-automatically under control of evaluators using the Simulator/Stimulator (SIM/STIM) developed and delivered to Fort Sill by Magnavox as part of the initial AFATDS contract.

(U) There is no need to rerun the Army's Concept Evaluation nor to duplicate the data collection activity of the Concept Evaluation. All the the data, analysis, and reports from the Concept Evaluation should be made available to the Marine Corps prior to the operational assessment. The Marine Corps could modify the data bases and other initialization data used in AFATDS to make the system look as much like a Marine Corps system as possible. This includes using Marine Corps names for units and operational facilities and configuring AFATDS to reflect Marine Corps organization (e.g., SASS, SACC, FSCCs, FDCs).

OPERATIONAL CONSIDERATIONS FOR AFATDS OPERATIONAL ASSESSMENT

- Marine Corps NATO Northern Region scenario
- Manual or automated Time Ordered Event List (TOEL) simulation support
- Should not duplicate Army Concept Evaluation (CE) data collection
- Should initially focus on the capability and adaptability of AFATDS to support Marine Corps fire support execution
- Should examine other functions developed for CE such as planning, movement control, and status relative to adaptability and/or development of specific Marine Corps requirements

(U) The Army Concept Evaluation at Fort Sill will be completed in April 1989, but personnel and facilities at Fort Sill are committed until September 1989. Thus, the target for an AFATDS operational assessment by the Marine Corps could be late in FY89 or early in FY90.

(U) The scope of an initial assessment could be limited to using the existing Concept Evaluation software together with a modified TOEL and other initialization data. Early estimates of such an assessment are from $0.3 million to $1 million. Additionally, the Marine Corps has time to begin development of some Marine Corps-unique functions, such as naval gunfire and integration of air support, early in FY89. Some of these functions could however, be tested as part of the initial assessment, or a follow-on assessment could be scheduled later in FY90 (a follow-on assessment early in FY90 could be a burden on personnel and other evaluation resources). Three options for modified software are outlined in Appendix A. The development of this software could range from $0.7 million to $4 million.

(U) Fort Sill is the obvious, but not the only, choice for the location of an AFATDS assessment. Fort Sill could provide experienced personnel, extensive data collection facilities, and several choices for environment. The basement of a building is being used for the Concept Evaluation and would appear to be satisfactory for the assessment. Support costs for participants might be less at Camp Pendleton or Camp Lejeune, but technical support costs might be higher. An assessment at Camp Pendleton or Camp Lejeune might provide greater visibility to the Marine Corps, and it might be easier to extend the time period for the evaluation at these locations.

(U) An early estimate for the assessment is $0.3 million to $5 million. The cost drivers are the length and type of training (four weeks may be required for participants), availability of equipment, and the amount of new software to be developed for the additional functions. There are two options for obtaining equipment to support the test: borrow the hardware provided to Fort Sill or arrange with Magnavox to lease reconfigured in-house equipment. About 10 to 12 workstations would be needed for the assessment.

RESOURCE CONSIDERATIONS FOR AFATDS OPERATIONAL ASSESSMENT

- **Opportunity window begins in September 89 when Army CE data has been compiled; target could be late FY89 or early FY90**
- **Scope**
  - **Initial assessment using existing software and modified data (e.g, TOEL)**
  - **Additional assessment with new and modified functions**
- **Potential locations**
  - **Fort Sill**
  - **Camp Pendleton (I MEF or MCTSSA)**
  - **Camp Lejeune (II MEF)**
- **Cost Drivers**
  - **Training (4 weeks)**
  - **Borrow or lease AFATDS terminals (12-14)**
  - **Amount of new software development for additional functions (e.g., naval gunfire, air integration)**
- **Early estimate: $0.3 - 5 million (support costs)**
- **Other resource considerations (e.g., availability of participants)**

(U) The section on interoperability discusses technical issues for the support of information exchange for fire support between the Army and the Marine corps.

(U) During the course of the study, IDA received additional tasking from OASD(C3)-T&TC3, with funding provided by JTC3A, to identify technical concerns related to interoperability issues for Army-Marine Corps information exchange standards for bit-oriented messages and protocols. This section summarizes the results of the analysis in support of that tasking.

RESULTS

- REQUIREMENTS
- EVALUATION OF SYSTEM OPTIONS
- POTENTIAL ACQUISITION MILESTONE SCHEDULE
- OPPORTUNITIES
- INTEROPERABILITY ISSUES

(U) The draft FIREFLEX ROC specifies interface requirements[8] for the following Army systems: AFATDS, BCS, Howitzer Improvement Program (HIP), LTACFIRE, MDS, Multiple Launcher Rocket System (MLRS), Q-36, Single-Channel Ground-Air Radio System (SINCGARS), and TACFIRE. The interfaces to the Army fire support systems are all based on TACFIRE character-oriented messages (COMs) and protocols. The FIREFLEX draft ROC also specifies interface requirements for the following additional systems fielded or planned to be fielded by the Marine Corps: DCT, Modular Universal Laser Equipment (MULE), FIREMAN, PLRS, AN/PRC-77 and AN/VRC-12 family of combat net radios (CNR), Marine HF and UHF radios, and the Unit-Level Tactical Data/Circuit Switches (ULTDS/ULCS). DCT and ULTDS use MTS bit-oriented messages (BOMs) and protocols.

(U) Fire support command and control (C2) systems could manage several types of messages and protocols. Indeed, AFATDS now supports TACFIRE protocols and is planned to support character-oriented U.S. Message Text Formats (MTFs) from the Joint Interoperability Tactical Command and Control System (JINTACCS) Program, as well as NATO Standardization Agreement (STANAG) 5620 messages. However, if the Marines acquire an Army C2 system, such as AFATDS, agreement would still be needed on fire support information exchange standards to achieve interoperability with other Marine Corps fire support and communications systems (e.g, DCT and ULTDS).

(U) As will be amplified on charts that follow, the Army and the Marine Corps have been working since 1984 on a technical interface design plan (TIDP) for bit-oriented information exchange messages and protocols. Substantial progress has been made, but additional work is needed to reach agreement on the lower-level computer-to-computer communication protocols.

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8 (U) See Appendix B for more information on USMC interface requirements.

IMPROVEMENTS IN MARINE CORPS/ARMY INTEROPERABILITY

- FIRE SUPPORT C2 SYSTEMS COULD MANAGE SEVERAL TYPES OF MESSAGES AND PROTOCOLS (MTS, TACFIRE, US MTFs, STANAG 5620)
- AGREEMENT ON FIRE SUPPORT INFORMATION EXCHANGE STANDARDS IS NEEDED BETWEEN ARMY AND MARINE CORPS, EVEN IF MARINES ACQUIRE AN ARMY SYSTEM
- SUBSTANTIAL PROGRESS ON THESE STANDARDS HAS BEEN MADE
- ADDITIONAL WORK IS NEEDED TO REACH AGREEMENT ON ARMY-MARINE CORPS BIT-ORIENTED INFORMATION EXCHANGE (COMMUNICATION PROTOCOLS)

(U) The Army has been a proponent of variable message formats with bit-oriented protocols for many years (since 1978). The Army proposed variable message formats (VMFs) for use as an option in Joint Tactical Information Distribution System (JTIDS) networks for use with Class 2M terminals. The term "VMF" was originally used to reflect the fact that the messages would have variable message lengths and field repeatability that was not provided with other JTIDS formats.

(U) In a joint memorandum to the Program Director of JINTACCS on 18 June 1984, the Army (HQDA/ADCSOPS-C4) and the Marine Corps (HQMC-CCA) agreed that JINTACCS character-oriented messages (COMs) were not satisfactory for fire support, that bit-oriented messages (BOMs) have significant advantage over COMs for fire support, that MIFASS was designed to BOM standards and AFATDS was planned to transition from COM to BOM standards,[9] and that a joint fire support working group was needed to develop and coordinate fire support BOM standards for the two Services.

(U) A Fire Support Subgroup (FSSG), under JTC3A, has been meeting since 1984 to develop these BOM standards within the JINTACCS program. The FSSG includes representatives from MCRDAC, OPM FATDS, ODISC4, TSM FSC3, the Center for Software Engineering at Fort Sill, and CECOM. It is chaired by a senior civilian from MCTSSA.

(U) As background for the discussion that follows, TACFIRE should be viewed as essentially a COM-based system, with very limited capability to implement BOM standards (some bit compactification techniques are now being developed for TACFIRE computer-to-computer exchanges). However, the AFATDS design isolates the software and data for data bases, functions, communications protocols, and message format conversions. This means that the underlying message formats and syntax functionality in AFATDS is, to a great degree, independent of the data being transmitted. It is therefore possible that AFATDS could be either BOM-based, COM-based, or both.

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9 (U) AFATDS transition to BOM standards is planned for Block 3 (not before FY95).

JOINT BOM INFORMATION EXCHANGE

BACKGROUND

- Original Army variable message formats (VMFs) planned for use in JTIDS networks with Class 2M terminal
- Joint Army-Marine Corps 1984 memo to Director, JINTACCS, stated:
  - JINTACCS character oriented messages (COMs) not satisfactory for fire support (FS)
  - BOMs have signficant advantages over COMs for fire support
  - MIFASS designed to use BOM standard
  - AFATDS to transition from COM to BOM standards
  - Joint fire support working group requested to develop and coordinate FS BOM standards
- TACFIRE is a COM-based system; AFATDS could be either BOM-based, COM-based, or both.

(U) This chart provides an overview of the rationale for emphasizing bit-oriented messages and protocols for information exchange for future command and control systems. The goal is efficiency. The drivers that make the efficiency of BOMs over COMs so important are: the improved sensor systems planned to be fielded in the 1990s, requiring near real-time and high data rate throughput; better intelligence support with improved fusion; the availability of automated support for command and control, and the severe limitations on tactical communications. For command and control systems based on using computers for information exchange, display and printer interfaces are managed by processors that have no requirement for human-readable exchange formats.

(U) Efficiency for data exchange is critical to operational security (staying off the air) and operating in the face of enemy jamming or interference due to friendly electromagnetic congestion. In the 1990s, the communications environment requires minimizing data transfer time and restricting the use of wide radio frequency (RF) bandwidths.

(U) Efficiency requirements in the fire support area extend to other functional areas and to cross-functional information exchange as well. As indicated above, the rationale is based on the high volume of data, survivability (minimize transfer time), and limited communications bandwidth. BOMs are already in use in air defense, e.g., Tactical Data Links (TADIL) A, TADIL B, and the Joint Tactical Information Distribution System (JTIDS).

(U) The two Services have agreed to most of the standards to be used for bit-oriented message exchange. However, Army proposes to use the STANAG 4202 communication protocols, based in part on the TACFIRE experience, whereas the Marine Corps has already implemented commercial and government-standard communication protocols. If not otherwise directed, the Army and the Marine Corps may implement incompatible data communications protocols for the BOM standards.

JOINT BOM INFORMATION EXCHANGE

OBSERVATIONS ON BOM AND PROTOCOLS

- Increased target processing requirements will, in the future, cause shift from COM to BOM for more efficient information exchange and message storage. Drivers are:
  - Improved sensors
  - Better intelligence support
  - Automated support for C2 functions
  - Limitations on tactical communications
- In 1990s communications environment (e.g., enemy ESM and electromagnetic congestion) requires minimizing communications transfer time and restricting use of wide radio frequency bandwidths
- Bit oriented variable message formats are needed for fire support and other functional areas
- If not otherwise directed, the Army and Marine Corps may implement incompatible protocols for BOM standards

(U) Through the Fire Support Subgroup (FSSG), JTC3A has been promoting the development of BOM standards. This is a main feature of the JTC3A charter: "The JTC3A, in coordination with the unified and specified commands, is responsible for developing technical interoperability standards for tactical communications use during joint operations."[10] The FSSG has now reached joint agreement (only the Army and Marine Corps have participated) on the VMF BOM information exchange standards in many areas: 26 JINTACCS K-series fire support message formats, a complete message syntax, a data element dictionary, and interface operating procedures (IOPs). The FSSG has agreed to recommend that all but the IOPs be put under configuration management by JTC3A, as part of the JINTACCS program. These agreements represent a major, but incomplete, step towards interopera[illegible]y.

(U) Agreement still must be reached on the computer-to-computer data communications protocols. The International Standards Organization (ISO) has been developing standards in this area for many years, and these standards are in the process of being adopted by NATO. The emerging STANAGs for open systems interconnection (OSI) will be STANAGs 4250-4257 and 4261-4267, and they will all be, by design, bit-oriented exchange standards.

(U) The highest-precedent standing agreement for communications protocols on CNR, the only agreed Army-Marine Corps communications means, is STANAG 4202.[11] In 2 to 4 years, STANAG 4202 will be superceded by STANAG 4262. Further, the U.S. Government Open Systems Interconnection Profile (GOSIP) specifies only ISO standards, and GOSIP has been mandated by ASD(C3I) for use by DoD. The Army is firmly recommending STANAG 4202, whereas the Marine Corps is firmly recommending MTS protocols that are compatible with, and to a large degree area conformant to, GOSIP and a draft STANAG 4262. Both Services agree that GOSIP and the OSI STANAGs 4250s and 4260s should eventually be the governing standards.

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10 (U) *Unified Action Armed Forces (UNAAF)*, JCS Pub. 2, The Joint Chiefs of Staff, December 1986, UNCLASSIFIED, p. 3-84.

11 (U) The protocols of STANAG 4202 are very similar to TACFIRE protocols.

JOINT BOM INFORMATION EXCHANGE

PROGRESS OF STANDARDS DEVELOPMENT

- **Joint agreement on VMF Technical Interface Design Plan (TIDP)**
  - Overview
  - Data Element Dictionary
  - K Series Fire Support Message Formats
  - Interface Operating Procedures
- **First three of these will be put under configuration management by JTC3A (as part of JINTACCS), possibly by 1Q FY89**
- **Army and Marine Corps proposed different and incompatible protocol standards for communications underlying BOM**
  - Army standards based on STANAG 4202 [and consistency with TACFIRE]
  - Marine Corps standards based on FED-STD-1003A and TRI-TAC; consistent with MIL-STD-188-116 (draft) and FIPS 146 (Government Open Systems Interconnection Profile, GOSIP)
  - Differences in Service recommendations are in message headers, data flags, frame formatting, synchronization, and error coding
- **AFATDS at IOC in FY92 is planned to have TACFIRE, US MTF, and STANAG 5620/4202 COM-based interfaces**

(U) In a memorandum to JTC3A in August 1988,[12] the Army provided an overview of its position on the work being completed by the FSSG. The Army noted that CNR is the only available communication means to support the joint interface and that STANAG 4202 is the governing NATO standard for CNR. The Army further supported the Marine Corps recommendation to adopt GOSIP protocols. The Army questioned "whether the requirement for interfacing the Army and Marine automated fire support systems has been properly identified, documented and supported outside the directly involved technical community." The Army further questioned whether the use of BOM versus JCS Pub 25 U.S. MTFs is consistent with current JCS policy.

(U) The Marine Corps has been developing a bit-oriented communications architecture since the beginning of MIFASS engineering development in 1979, for use in all functional areas. The Marine Corps has already implemented bit-oriented message standards and protocols in the DCT (fielded) and the ULTDS (approved for production but funding not yet approved).[13] The Marine Corps plans in the near future to implement MTS protocols in the TAOM and ATACC.

(U) In general, the Marine Corps is developing a common user bit-oriented data communications system to support information exchange in all functional areas, to include fire support and aviation. The Army has focused its bit-oriented development toward specialized TADILs for air defense. Army implementation of BOMs for AFATDS and between AFATDS and other functional area C2 systems is not planned until 1995, at the earliest.

(U) During the November 1988, the FSSG agreed to finalize three volumes of the VMF TIDP. However, there is no sign that agreement will soon be reached in the FSSG on the communications protocols to be used to exchange the agreed to BOMs. A 27-month plan for selecting protocol standards, layer by layer, is being drafted in the FSSG; this plan will be discussed at the February 1989 FSSG meeting.

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12 (U) "Army Understanding of VMF TIDP Issues," Memorandum for the Record, ODISC4/SAIS-ADO, 9 August 1988, UNCLASSIFIED.

13 (U) At the OSI layer 2, the Marine Corps protocol standard is based on High-Level Data Link Control (HDLC) procedures defined in ISO 4335 and ISO 7809.

JOINT BOM INFORMATION EXCHANGE

STATUS OF TRANSITION TO BOM

- **Army:**
  - Views purpose of VMF TIDP work to document Army-Marine Corps fire support system interface parameters
  - Sees combat net radio (CNR) as only available communications means
  - Recommends STANAG 4202, a US agreed protocol for data transmission over CNR, as baseline for protocol with future transition to NATO version of GOSIP
  - Questions whether the requirement for interfacing automated FS systems has been properly identified and documented (Army will take lead to resolve)
  - Questions whether use of BOM vice JINTACCS COM message text formats for FS system interface is consistent with JCS policy (Army will clarify)
  - Views VMF messages & data communications protocols as separate and independent issues
- **Marine Corps has firm requirements for BOM VMF system interfaces**
  - Bit-oriented communications architecture begun in 1979
  - BOMs & ISO standard protocols already implemented in DCT & ULTDS (TRI-TAC)
  - BOM interfaces soon to be added to ATACC & TAOM
  - USMC recommends MTS communications protocols be used for the joint interface
- **November 1988 meeting to address conflict on protocols**

(U) The briefing report ends with two charts that summarize the conclusions and provide some suggested courses of action to OSD.

CONCLUSIONS AND SUGGESTED COURSES OF ACTION

(U) This chart summarizes the conclusions provided in the previous sections on the results of the study. Specifically, there is no new fire support ROC to replace the MIFASS ROC, and while the draft FIREFLEX ROC has been developed, it addresses only near-term requirements and some additional work is needed to define the Marine Corps objective (far-term) fire support requirements.

(U) Three systems have been identified that could meet, at least in part, the FIREFLEX requirements.

(U) While research and development (R&D) decisions could be made in FY89 on modifications of two of the system options that would focus evolutionary development, and while procurement decisions on these two options could be made at the end of FY90, the procurement decisions should be deferred until the Marine Corps has assessed AFATDS.

(U) An operational assessment of AFATDS could be conducted by the Marine Corps beginning late in FY89 or early in FY90. Moreover, to test adaptability of AFATDS, the Marine Corps should begin development of some new software and include these modifications in the initial or a follow-on assessment. If funding were available, the new software development could be initiated early in FY89 and evaluated in FY90. If carefully coordinated with the Army and developed in accordance with production standards, some of this software could be included in AFATDS Block 1 at the end of FY92.

(U) Agreement is needed on the communications protocols to be used to support the agree joint bit-oriented information exchange standards between the Army and the Marine Corps for fire support. If not otherwise directed, the Services may implement incompatible computer-to-computer communications protocols for BOM standards.

CONCLUSIONS

REQUIREMENTS

- Draft FIREFLEX ROC addresses only near-term requirements; some additional work is needed to define objective requirements

EVALUATION OF SYSTEM OPTIONS

- If modified, FIST DMD, LTACFIRE, and AFATDS could each meet, at least partially, FIREFLEX requirements

POTENTIAL ACQUISITION MILESTONE SCHEDULE

- R&D decisions on FIST DMD MOD & LTACFIRE MOD could be made in FY89

- Procurement decisions on FIST DMD MOD & LTACFIRE MOD could be made at the end of FY90, but should be deferred until AFATDS is assessed

OPPORTUNITIES

- An operational assessment of AFATDS concept could be conducted by Marine Corps beginning in late FY89 or early FY90; to test adaptability, some new software needs to be developed

INTEROPERABILITY

- If not otherwise directed, Army & Marine Corps may implement incompatible data communications protocols for BOM standards

(U) Several courses of action can be suggested based on the conclusions of this study. For AFATDS, OSD could request the Marine Corps to conduct an early assessment of AFATDS and assist in providing adequate resources. Additional funding would be required to develop Marine Corps-unique functions to test the adaptability of AFATDS.

(U) It should be noted that significant progress has already been made in this area. The FIREFLEX evolutionary acquisition strategy briefed by the PM Ground C2 (MCRDAC) to HQMC on 23 September 1988 included a plan to assess AFATDS in 4Q FY89 or 1Q FY90. In a meeting on 18 October 1988 between PM FATDS and PM Ground C2, the Marine Corps reaffirmed its intention to conduct an AFATDS assessment. The main remaining issue is the funding.

(U) For interoperability, one course of action would be to task JTC3A to examine the Service recommendations on the standards for computer-to-computer communications protocols and determine which protocol would be operationally best suited for BOMs to support battlefield data exchange requirements for the Year 2000.

(U) An additional course of action would be to request that JCS review, and if necessary, validate the requirements for a joint computer-to-computer communications protocol for bit-oriented messages. This is necessary to ensure that the lack of a joint requirement is not a roadblock for programming the funds to implement the K-series JINTACCS messages and protocols. Further, OSD could recommend that JCS take the necessary action, in concert with our Allies in NATO, to begin revising or redrafting the applicable STANAGs (e.g., STANAG 4202 or 4262) as necessary to meet future BOM interoperability requirements.

SUGGESTED COURSES OF ACTION

- **OASD (C3I) and ODUSD (TWP):**

  FOR AFATDS--

  - **Request Marine Corps to conduct AFATDS assessment, building on the Concept Evaluation, and assist in providing adequate resources**

  FOR INTEROPERABILTY--

  - **Task JTC3A to determine which communications protocol would be operationally best suited for BOM to support battlefield data exchange requirements for Year 2000**

  - **Request the JCS to review/validate requirements for a Joint BOM protocol for VMF messages and take steps to revise STANAGs as necessary to meet future BOM interoperability requirements**

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APPENDIX A

CONCEPT FOR A MARINE CORPS OPERATIONAL ASSESSMENT OF ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM (AFATDS)

APPENDIX A
CONCEPT FOR A MARINE CORPS OPERATIONAL ASSESSMENT OF ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM (AFATDS)

A. BACKGROUND

1. Operational Deficiencies

(U) There are serious deficiencies within the Marine Corps fire support systems. New systems and capabilities are needed to improve responsiveness to assist planning, and to link/network, distribute, process, and provide displays not only for the effective command and control of fire support assets, but also for the close integration of supporting arms with maneuver control fire support coordination. An expanded system is required to improve tactical control of fielded or about to be fielded advanced fire support systems, e.g., BCS, Q-36, and MDS, as well as to manage digital fire support communication nets. There are also deficiencies with respect to automated support for the integration of MAGTF's naval gunfire, close air support, and close in fire support, at all levels, with the fire and maneuver of ground forces. In short, the Marine Corps has a requirement for an automated system that will assist MAGTF commanders at all echelons in employing more efficiently the fires of all supporting arms.

2. Technology Potential

(U) The rapid development of microcomputer technology with automated data processing to transmit, receive, store, edit, distribute, and display vast quantities of digital information has potential application to Marine Corps tactical data systems. Clearly technology has the potential for assisting operational commanders to operate within the decision and execution time lines of opposing forces. This potential has been exploited in air defense systems. Specific application of technological enhancement to these C2 systems, however, if not done well, may present environmental and weight problems relative to field usage, as well as operator-machine interface difficulties under stressful combat conditions. The first step is to define the requirements and decide which C2 functions should be selected for automated enhancement. The second and decidedly more complex step is to determine how to introduce automated C2 improvements in an evolutionary and affordable manner. This is important in order to provide technological building blocks towards an

objective system while permitting a workable operator-machine interface and fire support community acceptance. It is important to note that available and affordable building blocks would not automate all required Marine Corps fire support functions desired for integration. Moreover they could cause major technological disruptions within the Marine Tactical System (MTS) communication architecture.

3. Marine Flexible Fire Support System (FIREFLEX)

(U) FIREFLEX, a near term system, is needed to provide tactical control of fielded and planned-to-be-fielded digital fire support systems as well as management of associated digital communication nets throughout the ground combat element (GCE) of the Marine Air-Ground Task Force (MAGTF). The Marine Corps for the next two years will be testing and evaluating enhancements with a planned Initial Operational Capability (IOC) for FIREFLEX during 3Q FY 92. A full operational capability (FOC) for FIREFLEX is planned for 3Q FY 94. FIREFLEX, when fielded, will be integrated as a building block into a follow-on and more capable long-term objective system termed the Fire Support and Maneuver System or FIREMAN.[1] A statement of Required Operational Capability (ROC) for FIREFLEX has been drafted and approved by MCCDC.

4. Fire Support and Maneuver System (FIREMAN)

(U) FIREMAN is an "umbrella" concept for a highly automated fire support tactical data system that would incorporate Marine Corps unique fire support and maneuver control functions into a mature system design. FIREFLEX would be a subset of FIREMAN. The proposed acquisition approach would emphasize an NDI approach for an objective FIREMAN system and might build on Army programs such as the Advanced Field Artillery Tactical Data System (AFATDS) and the Maneuver Control System (MCS). The FIREMAN system is designed to meet objective Marine Corps C2 fire support and maneuver requirements through the year 2000.

B. ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM (AFATDS)

1. Status

(U) The first phase of AFATDS development, which focused on software development with 1,200,000 lines of Ada code, will end with a U.S. Army concept evaluation (CE). This test is to be conducted at Fort Sill during the March-April 1989 timeframe. While additional

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1 (U) A new concept, Command and Control of the Battlefield (COMBAT), is being developed that may become the overall objective tactical command and control concept. FIREMAN may then be modified to address primarily maneuver functions.

development of AFATDS is required to reach an operational capability, the concept evaluation version of AFATDS contains most of the Army's major fire support functions and interfaces. The Army test will also involve both Marine Corps participants and observers.

2. AFATDS Potential Importance to the Marine Corps

(U) AFATDS is potentially a very important system to the Marine Corps. Historically, the Army has been the lead Service in the development of field artillery weapons and supporting tactical data systems. Further, the Marine Corps sends most of its field artillery officers and all enlisted personnel to Fort Sill for basic and advanced field artillery training. While there are some doctrinal differences in Marine Corps and Army fire support concepts, there are, for field artillery employment, many close parallels. In addition, there are specific interoperability requirements when Services participate in joint force operations. Either Army or Marine Corps joint force components could be tasked to provide fire support to adjacent Service forces. Additionally, there is as part of joint force operations, a requirement to exchange intelligence as well as operational, maneuver, fire support, and logistic support data. Today interoperability, when required, is frequently achieved by one Service operating both ends of a communications link. In the future, interoperability would be greatly facilitated should Service components utilize common tactical data systems. The results of a successful operational assessment of AFATDS could lead to efforts by the Marine Corps that would be major factors in furthering the Army's development and refinement of AFATDS. More importantly to the Marine Corps is that a successful test of AFATDS would be a significant step towards improving fire support automation requirements, and the building of the objective system.

(U) Specifically a common system would simplify and reduce future Army and Marine Corps costs for achieving interoperability as well as reduce acquisition costs. A problem, though, is that a common system could increase the cost and complexity for the Marine Corps to achieve intraoperability with a system not compatible with existing Marine Tactical System (MTS) messages and protocols. Nevertheless, the planned Block ? AFATDS has many objective C2 capabilities which fulfill both Army and Marine Corps needs as well as interfaces to current and planned fire support data systems as well as those of our allies. Further, AFATDS has an architecture and a responsiveness that permits maneuver control functions, such as those performed by the maneuver commander and his maneuver fire support coordinator, to perform a significantly enhanced and central role in fire support C2. TACFIRE-based systems do not include this feature. Moreover, AFATDS offers flexibility and many design features needed by modern tactical data systems such as survivability and maintainability. Finally, AFATDS development to date is mostly software. The software can be modified to meet both unique Army and Marine Corps needs even if the two Services eventually utilize different hardware.

C. MARINE CORPS ASSESSMENT OF AFATDS

1. The Need for an AFATDS Assessment

(U) While it is too early to make a decision on AFATDS as an objective system, the evolutionary development of FIREMAN would be more clearly defined if there were greater confidence in the adaptability of AFATDS for Marine Corps fire support C2. There is a strong need to find out whether the CE software could be an adequate building block or whether it is necessary to wait for Block 1 (1992) Block 2 (1994) or Block 3 (1998) software. Secondly, there is a need to find out if CE software provides an adequate base for FIREMAN objective maneuver control functions. A successful AFATDS assessment could provide guidance for identifying functions that need to be added. Thirdly, planning for, participating in, and analyzing such an assessment would exploit what the Army is doing and could assist in defining the required operational capabilities for both mature FIREFLEX and FIREMAN systems. Also important is that an AFATDS assessment would be a concrete action regarding an earlier Marine Corps commitment to consider AFATDS as a candidate objective system.

(U) Other considerations that bear on an AFATDS assessment by the Marine Corps are:

- AFATDS data might be required for a complete evaluation of other fire support system candudates.
- AFATDS, if procured, could be a reasonably inexpensive system since the Army has already developed much of the software, which is a major cost as well as major risk factor in major C2 of systems.
- Should AFATDS have a fundamental flaw, early exposure would be helpful.
- User comments would be helpful regarding menus, graphics, tables, charts, and response times towards improvement in AFATDS.
- New R&D funds may be made available in the next budget cycle, not only for an AFATDS evaluation, but also for the evaluation of near-term options.
- BOM/COM and protocol interoperability problems need to be resolved.

2. Assessment Opportunity

(U) Following the AFATDS CE by the Army in mid-FY 89, there is an opportunity for the Marine Corps to conduct an operational assessment of AFATDS. The Marine Corps already plans to observe Army formal qualification tests and the CE. Both Army and Magnavox representatives, as well as some Marines, will be experienced in testing procedures. The hardware will be in place, or could be relocated,

and the initialization data (data used to start a scenario or test) could be adjusted to reflect fire support coordination in the context of a Marine operation. This assessment would use the CE hardware and software, a Marine Corps scenario, and configurations of Marine Corps operational facilities. Additionally, "proof of concept" testing could be done on Marine Corps-unique functions and interfaces as well as a proof of concept for AFATDS adaptability. An assessment of these added AFATDS capabilities could be evaluated in a second phase in FY 90. Additional assessments in FY91 and FY92 could evaluate the evolving Army software and Army software modified to meet Marine Corps functional requirements.

3. Potential Assessment Issues

(U) The development of Marine Corps specific requirements for an objective FIREMAN system is anticipated to be evolutionary. System development should permit maximum growth and flexibility. Consequently, many of the issues currently affecting FIREFLEX[2] and FIREMAN development will probably not be fully resolved until a mature objective FIREMAN system is realized. The major issues affecting an operational assessment of AFATDS are as follows:[3]

- To what degree does AFATDS support maneuver control functions normally performed at Combat Operation Centers (COCs)? For example:
  - Can AFATDS be adapted to support the maneuver functions conducted for the Ground Combat Element? (E.g., develop and disseminate the operations order, associated annexes, fire plans, and fire orders; make available position location information to maneuver control subfunctions and other functions drawn from the ROC for Tactical Combat Operations and C4I2 operational concepts.)
  - How useful would a display of fire support coordination information for use by the maneuver commander be at each echelon?
  - How easily and quickly can the fire support plan be updated in support of the maneuver commander?

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2 (U) The top-level FIREFLEX issues for the LTACFIRE (BCT) and FIST DMD appraisals are: (1) Does the system work? (2) Does the system perform better than the current system? (3) Is refinement or further definition required in the FIREFLEX requirements? (4) What is the growth potential (future expansion/enhancement of capabilities) of the evaluated system?

3 (U) Prior to preparing a test plan, these issues need to be refined so that the resulting questions are testable. Additionally, evaluation criteria need to be defined.

- How effective is the display of battlefield geometry graphics, to include boundaries, fire support coordination measures, range fans, unit locations, and target locations? Are gun-target lines needed?
- How effective is the display of mission support information, such as displacement times, unit nonavailability periods, and the plans and schedules for displacement?
- How well does AFATDS permit transition from automated operations to degraded manual operations, such as for the case when AFATDS might suddenly be lost and personnel at the FSCC must continue to function in a manual mode? Would available printouts support this transition?
- In the event a node is lost, how suitable are AFATDS capabilities for continuing automated support at another node?
- What is the degree of compatibility with Marine Corps fielded/planned communications.

• To what degree will AFATDS support the fire support coordination functions normally performed at FSCCs? For example:

- How responsive is AFATDS to the maneuver commander's and the field artillery commander's guidance?
- How well does AFATDS support development of a target list? (S-2 and subordinate echelon target nominations; requests for fire; and receipt and action on submissions from organic and other intelligence nominations, from media such as FAX, photos, and debriefs)
- How well does AFATDS support development, maintenance, and selection of subsets for list of targets maintained at various FSCCs?
- How effective is AFATDS support for selecting targets, both by priority and by target number, to be attacked in support of planned operations .
- How effective is the support for allocating (referring) targets to available fire support means (e.g., aircraft, naval gunfire, artillery, mortars)?

• To what degree does AFATDS support fire control functions normally performed at FDCs? For example:

- How suitable is AFATDS in the fully automated mission processing mode?
- How suitable are the intervention points in AFATDS to supporting semi-automated mission processing?
- How suitable is AFATDS in preparing and modifying a schedule of fires, once the targets to be attacked have been selected?

- How suitable are the graphics support capabilities? For example:
  - How effectively and rapidly can fire support coordination measures and other graphical control features be developed in AFATDS?
  - How rapidly can a graphical display be disseminated to another terminal?
  - How effective are the AFATDS displays in assisting decision-making at the FSCCs and FDCs?
- What subjective and measured judgments can be made relative to AFATDS support for:
  - Fire support coordination
  - Fire support responsiveness for mission execution
  - Operations planning
  - Fire support planning
  - Message/order preparation?
- What is the impact of the AFATDS operator-machine interface on manpower requirements and training?
- How important is the automated support provided by AFATDS for each of the functional groups implemented in CE (e.g., develop field artillery support plan; perform field artillery movement coordination)?
- What is the potential of AFATDS to support the following in block changes or in P3I:[4]
  - Air support integration
  - Naval gunfire integration
  - Integration of position location information
  - Integration of computer systems being used in the FMF to support maneuver control
  - Marine Tactical System broadcast and switched protocols and messages implemented in the Digital Communications Terminal (DCT) and Unit Level Tactical Data Switch (ULTDS)?

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4 (U) This issue would test the adaptability of AFATDS by evaluating some new functions added to the CE software. See Section C5.

4. Applicability of AFATDS Functions to Marine Corps Operations

(U) Not all of the functions provided in the AFATDS CE software are required by the Marine Corps. Table 1 provides an initial prioritization that could be used as a guideline for selecting the functions to be evaluated. The AFATDS mission categories outlined in Table A-1 and Annex A are fire support execution, fire support planning, movement control and field artillery fire direction operations. The two most important functions relative to "steel on target" and precise mission execution, whose effectiveness may be enhanced with automatic support, would be the execution and fire direction operations functions closely followed by the planning function. The remaining movement control function and several other subfunctions as indicated on Table A-1 may not be required for Marine Corps operations or test assessment. The basis for <u>not</u> being required would be that a function is:

- Performed infrequently.
- Easily performed manually.
- Oriented to peacetime and training requirements that seldom pertain in a combat environment.
- Requires a high degree of professional judgment rather than a manipulation of factual data.

(U) Table A-1 lists all current categories and functions that will be part of the Army CE. The right hand provides an operational evaluation. A number 1 indicates "operationally required;" number 2 indicates "operationally desired" and number 3 indicates "not operationally required." This table is provided as a tool for subsequent refinement of what functions should be evaluated in an AFATDS assessment.

Table A-1. Example Prioritization of AFATDS Functions To Be Included in an Assessment[a]

Fire Support Execution	
Perform TDA Requirements Analysis	3
Perform Fire Support Attack Systems Analysis	2
Develop Order to Fire	1
Perform Fire Support Status Reporting	1
Perform Target Processing	1
Perform TDA Reporting	2
Perform FA Status Reporting	1
Perform FA Attack System Analysis	1
Prepare FA Fire Order	1
Fire Support Planning	
Develop Fire Support Guidance	1
Develop Fire Support Plan	1
Determine Target Acquisition Capability	1
Determine FA Commander's Concept of Operation	2
Develop FA Support Plan	1
Coordinate Survey Support	3
Develop FA Logistics Support Plan	3
Movement Control	
Perform Fire Support Movement Coordination	3
Perform FA Movement Control and Coordination	3
Prepare FA Movement Request	3
Fire Direction Operations	
Determine Fire Unit Capability	1
Perform Fire Mission Processing	1
Perform Fire Mission Status Reporting	1
Conduct Meteorological Operations	3

a. This initial prioritization is taken from "Assessment of Tactical Data Systems," IDA Report R-326, April 1988, SECRET.

5. Potential New Capabilities To Be Included in AFATDS Assessment

(U) The following additional capabilities appear to be appropriate to a Marine Corps version of AFATDS.

- Incorporate of position location information (PLI) data in fire support coordination functions.
- Perform naval gunfire (NGF) support management
  - Manage a list of NGF targets nominated for engagement.
  - Determine which on-station NGF ships can range the target.
  - Process NGF missions.
  - Determine how much and what type ammunition is required to achieve desired effects (neutralization, destruction, etc.). Incorporate NGF JMEM data in target value analysis and target attack analysis functions.
  - Determine block or limits of airspace required to engage target.
  - Provide on request a one-dimensional graphic display of gun-target line for on-going or planned missions with notations for time on target (TOT), maximum height of trajectory, and planned fire mission ending.
  - Perform fire mission status reporting.
- Provide semi-automated support to air integration
  - Graphically display a standard aircraft routing structure (two dimensional) with initial points, routes, and control check points superimposed on a battlefield map.
  - On request, graphically display PLI data for unit and aircraft locations. Also, display map-derived unit and aircraft locations when desired.
  - By query, display a one-dimensional graphic gun-target line for on-going or planned fire missions with notations for TOT, maximum height of trajectory (ordinate), and planned ending.
  - Display and store status of air support missions (e.g., ordnance load configurations and time-on-station).
  - Support word processing and digital message preparation with a printer.

- Disseminate Air Tasking Order extracts as appropriate to the GCE mission.
- Store, update, and display tactical air support request (TAR) and air support request (ASR) messages.
- Receive, store, and distribute Air Tasking Order to GCE.
- Provide access to and display of low altitude Enemy Order of Battle (EOB) as required.

6. Assessment Test Objective

(U) The objective of an AFATDS assessment is to evaluate the potential utility of AFATDS functionality for application in a Marine Corps 1990 objective fire support system. Those functional groups which may be the best focus for the flexibility and adaptability of AFATDS to meet current and future requirements are, in order of suggested priority:

- Fire support execution
- Incorporating Commander's guidance
- Fire support planning
- Fire support coordination
- Maneuver control planning
- Continuity of operations
- Processing Marine Corps-unique messages.

7. Evaluation Approach

(U) A Marine Corps operational assessment of AFATDS could be scheduled for two phases. Each phase, as desired, would incorporate those selected software and system modifications and developments listed in Table A-2. Phase 1, Option 1, represents only those changes that would modify the initialization data to the extent necessary to permit use of Marine Corps OPFACs, SOPs, and unit designators. Naval gunfire could be simulated by assigning an Army 8-inch gun battery as an NGF ship. The threat and scenario could be viewed to show a maritime context with some land areas turned into simulated water. The Simulator/Stimulator (SIM/STIM), which is used

by the Army to drive the scenarios through a Time-Ordered Event List (TOEL); could be adapted to drive a Marine Corps-developed TOEL. There would be no changes to functional flows, functions, messages, plans, reports, or interfaces, except for designation of a DASC, SASS, and SACC.

(U) Should the Marine Corps desire, the AFATDS assessment could run in conjunction with a command post exercise (CPX). This would result in a better assessment of how AFATDS could support maneuver control, particularly with respect to incorporating commanders' guidance, and improvements for fire support and maneuver planning.

(U) Location of Phase 1 could be at Fort Sill or an East or West Coast location as desired .

(U) Phase 2 would, in large part, test those Marine Corps requested modifications to CE functional software as well as new functions, messages, and interfaces. Table A-2 summarizes some elements that are being considered for software modifications. The baseline (Phase1) incurs no changes to software. Options 1, 2, and 3 reflect a spectrum of changes to AFATDS CE that could be assessed. Assessment highlights of Phase 2 could include: (1) incorporation of PLRS data with two dimensional graphic displays of slow moving helicopters and fixed-wing aircraft for near-real-time fire support coordination, (2) display of gun-target lines, (3) improved procedural capabilities for control of close air support aircraft, and (4) battlefield graphic displays for maneuver commanders.

(U) Additionally, a Phase 2 evaluation could utilize the Northern European setting provided by the Marine Corps Midrange Threat Scenario and Target List 1B (1990-1995). This scenario is on a computerized database designed to be run on a TEMPEST-approved IBM PC compatible computer. The scenario provides a broad spectrum of tactical options including a variance of friendly and threat forces. A suggested Command and Control Information Exchange (C2IE) Element organization (Figure A-1) represents a Marine Expeditionary Brigade (MEB) organization. However, the scenario provides for both MEB as well as Marine Expeditionary force (MEF) operations. Possibly the MEB organization could be utilized for the first assessment. Later for the follow-on evaluation, a MEF organization for combat could be used which would ensure the "worst case" or most stressed operational environment. The MEF scenario might also be the soundest basis for evaluating aviation and NGF functions when they become available.

Table A-2. AFATDS Assessment Software Options

Changes To AFATDS CET	Phase I (Could run without SIM/STIM)	Phase 2 Options for New Software Development		
		Option 1	Option 2 (Added to Option 1)	Option 3 (Added to Options 1 and 2)
Change SIM/STIM				
• Mission Threads • TOEL	• Same, with USMC OPFAC names edited	• Revise force structure table (3 Bn/Bde)	• Create new TOEL (Use in manual mode or with SIM/STIM)	
• Basic Scenario	No change			
Initialization Data	• USMC SOP guidance • USMC OPFAC names • Initial target list • Subscriber tables • Unit names	Same	Same	Same
Human Interface	No change	• Changes to screens	• New symbols • 5-Paragraph field order (and graphics overlays)	
Message, Plan, Reports	No change	• New reports using existing data	• New messages (e.g., 26 MTS) • New protocol (e.g., MTS)	
Functional Flows	No change		• Call for fire direct to Bty FA TACOPS (Voice via TGP)	
New Functions	No change (use 6" Bty for NGF ship)	• New graphic entity for helos with auto update • Helo with tail • Gun tgt lines, selective		• CAS • PLRS I/F • NGF functions (new atk units, JMEM)
New Interfaces	No change except for DASC, SACC, and SASS.		• Limited PC/MS DOS I/F (RS-232) • Very limited PLRS I/F (PC/GRID) • Fold new message formats into TACFIRE envelope, transmit via TACFIRE protocols	• 5620 NATO I/F

NOTE: Each option includes all capabilities of options with lower numbers (e.g., Option 3 includes Options 1 and 2)

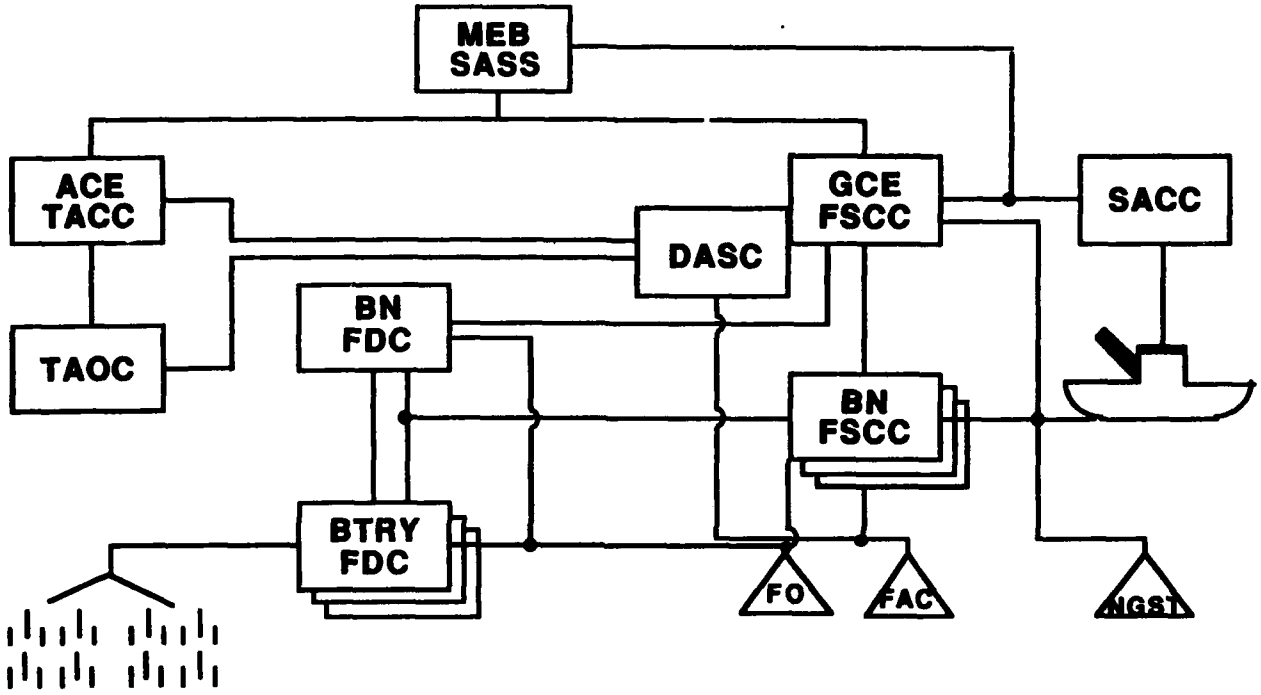

Figure A-1. C2IE Element Organization for AFATDS Evaluation

8. Assessment Cost Options

(U) The cost options start with a Phase 1 assessment that assumes no new software development. Phase 1 cost variations will be based primarily on site location. A Fort Sill location would not require acquisition for leasing of Magnavox equipment. However, there would be temporary additional duty (TDY) costs associated with the Marines assigned to Fort Sill for the assessment period. Training costs at Magnavox would be about $120,000 for 1 month of individual operator and team training for approximately 20 Marines. Should the Marine Corps elect to conduct Phase 1 at Camp Lejeune or Camp Pendleton, there would be AFATDS terminal leasing and shipping costs costs, but reduced TDY costs. Table A-3 provides for a summary of Magnavox assessment costs. Figure A-2 illustrates the proposed configuration baseline for AFATDS terminals.

Table A-3. Phase 1 AFATDS Assessment Costs

Equipment Lease per Month*	$16,000
Magnavox On-Site Support	$100,000
Training 20 Marines (Individual and Team)	$120,000

* Not required if AFATDS equipment at Fort Sill is used.

(U) It is anticipated that a Phase 2 assessment would be accomplished at Camp Lejeune or Camp Pendleton with a supporting CPX. There would be some additional operator training required for an estimated additional 15 personnel. The major costs for Phase 2 would be additional software development. It is estimated that software development costs could range from $0.7 million to $4 million. Preliminary costs for desired new functions are estimated as follows:[5]

NGF	$560K
CAS	$640K
Maneuver Control Planning	$130K
Marine DCT Protocol and Link (H/W and S/W)	$675K
PLRS Interface (HW and S/W)	$780K
Tactical Display Function	$400K
SIM/STIM Costs for New Scenario	$200K
Screen Conversion Scrub	$175K
TOTAL	$3,560K

Additionally, there would be the cost of modifying some CE AFATDS functions.

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5 (U) The costs are only estimated and require additional study as well as subsequent negotiations.

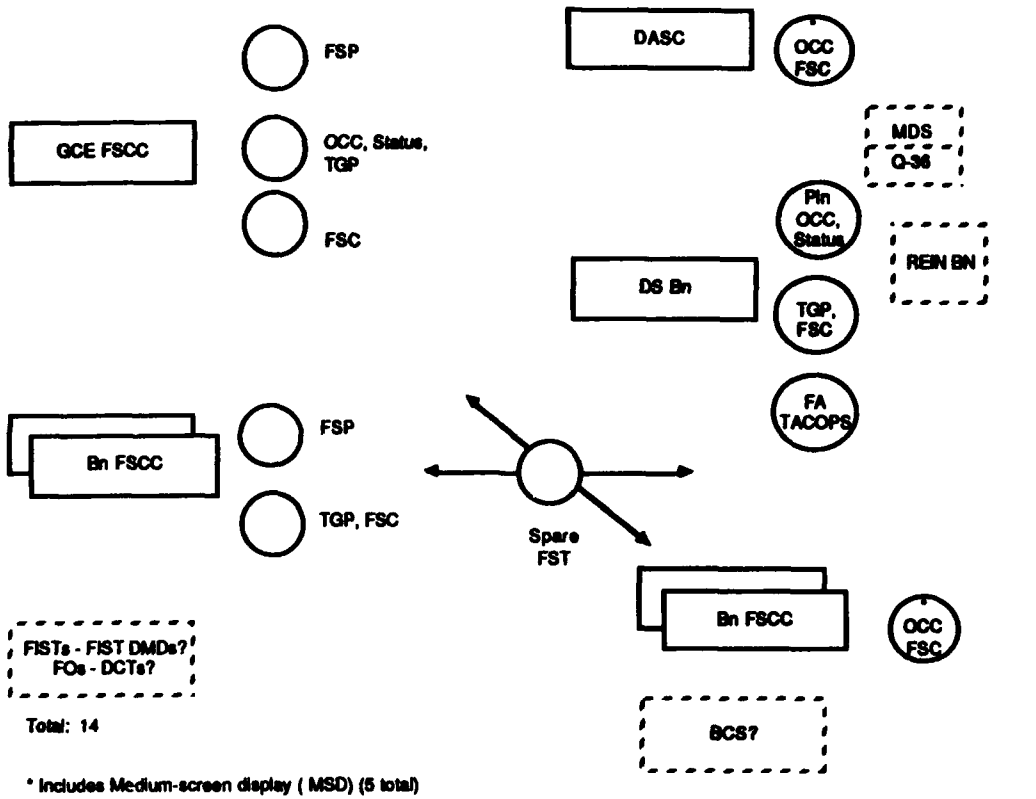

Figure A-2. Example Configuration Baseline USMC Assessment of AFATDS

(U) The proposed functional enhancements include:

- Naval Gunfire Support -- add naval gun characteristics for 5" and 16" guns, add munitions effects tables, add new messages in DCT format, and provide hardware interconnectivity.
- Close Air Support -- add air delivered munitions effects tables, and add air delivered effects algorithm, add digital messages to and from AFATDS and Air Command system.
- Maneuver Control Planning -- AFATDS CE software supports the creation of the standard five paragraph field order and battlefield graphics. The only change planned is a change to support USMC unit naming conventions.
- Marine DCT Protocol & Link Characteristics -- make modem firmware changes and communications communications software changes necessary to support DCT messages, add physical connectors, and make changes required for physical interconnectivity.
- PLRS capability -- make hardware and firmware changes, provide software to allow operator to query for unit locations, provide periodic query and database update capability, provide coordinate conversion software, and support passive acceptance of updates at low data rates.
- Tactical Display Function -- add air corridors, gun-target lines, display moving helicopters, add additional Marine specific symbols, add aircraft reporting locations for display on call, and modify data bases as required.
- SIM/STM costs for New Scenario -- modify SIM/STM to support Marine-unique functional flows and TOEL
- Screen Conversion Scrub -- generally limited to scrubbing AFATDS screens to make them fit Marine nomenclature and procedures more closely.

(U) The scope of a Phase 2 assessment would in large part be determined by early FY89 funding for software development. In as much as the Army version of AFATDS for Blocks 1 and 2 would also benefit from desired Marine Corps initiatives, commitment to additional AFATDS software development is required in FY89.

ANNEX A
AFATDS FUNCTIONS TO BE TESTED BY THE ARMY

An outline of the AFATDS functions for Army CE by mission category is as follows:

FIRE SUPPORT EXECUTION

1. PERFORM TARGET DAMAGE ASSESSMENT (TDA) REQUIREMENTS ANALYSES
   - Determine TDA Requirements
     - Determine if TDA is required
     - Prepare TDA request
   - Update TDA requirements file

2. PERFORM FIRE SUPPORT ATTACK SYSTEMS ANALYSIS
   - Select a target to attack
     - Highest priority target off the target nomination list
     - Operator target selection overrides
   - Select fire support attack system
     - Determine attackable target
     - Determine system(s) capable of attack
     - Determine system(s) capable of required effects
     - Determine attack systems

3. DEVELOP ORDER TO FIRE
   - Develop order to fire
     - Transmit to the selected attack system
     - Create order to fire file maintenance
   - Perform order to fire file maintenance
   - Perform fire support mission status reporting

4. PERFORM FIRE SUPPORT STATUS REPORT
   - Create fire support system status
     - Attack system status
     - Sensor system status
     - Command and control system status
     - Other system status

Create fire support status report
Maintain commander's critical information requirements data

5. PERFORM TARGET PROCESSING
Compare sensor data to target selection standards
    Compare information to target selection standards
    Create target file
Perform target duplication checks
    Compare target-to-target file
    Reject duplicate targets
    Update target file
Create target nomination list
    Determine targets routed to IEW
    Determine targets for attack by directed attack systems
    Prioritize targets
Perform target file maintenance
    Compare TDA report to required effects
    Determine updated target flags
    Purge/update targets

6. PERFORM TARGET DAMAGE ASSESSMENT REPORTING
Select sensor
    Select sensor
Evaluate TDA Report

7. PERFORM FIELD ARTILLERY (FA) STATUS REPORTING
Create FA status
    FA attack support system status
    FA sensor system status
Create FA status report

8. PERFORM FA ATTACK SYSTEM ANALYSIS
Determine FA unit(s) in range
Determine FA unit(s) capable of required effects
    Determine FA ammunition requirements
    Determine FA unit capable of required effects
Select FA unit(s) to fire

9. PREPARE FA FIRE ORDER
   - Create fire order
   - Perform fire order file maintenance
     - Determine fire order status
     - Purge fire orders

FIRE SUPPORT PLANNING

10. DEVELOP FIRE SUPPORT (FS) PLANNING GUIDANCE
    - Determine supportability of course of action
      - Determine n^{th} course of action supportability
      - Compare courses of action
    - Prepare FS planning guidance
      - Create FS planning guidance

11. DEVELOP FIRE SUPPORT PLAN
    - Create FS plan
      - Create heading data
      - Create situation data
      - Create mission directives
      - Create execution directives
      - Create command and signal directives
    - Obtain FS plan approval

12. DETERMINE TARGET ACQUISITION (TA) SUPPORT CAPABILITY
    - Create TA capability file
    - Determine acquirable and non-acquirable targets
    - Determine acquirable/non-acquirable target types

13. DETERMINE FA COMMANDER'S CONCEPT OF OPERATION
    - Determine FA course of action
      - Develop courses of action
      - Determine recommended courses of action

14. DEVELOP FA SUPPORT PLAN
    - Create FA support plan
        - Create heading data
        - Create situation data
        - Create mission directives
        - Create executive directives
        - Create service support directives
        - Create command and signal directives
    - Obtain FA support plan approval
    - Develop implementing instructions

15. CONDUCT METEOROLOGICAL OPERATIONS
    - Perform data file maintenance

16. COORDINATE SURVEY REPORT
    - Perform survey file maintenance

MOVEMENT CONTROL

17. PERFORM FIRE SUPPORT MOVEMENT COORDINATION
    - Validate movement request
    - Update requests
    - Perform movement file maintenance

18. PERFORM FA MOVEMENT COORDINATION
    - Develop movement requirements
        - Determine requirement to move
        - Determine new location
        - Determine movement time requirements
        - Determine movement route requirements
    - Prepare movement order
    - Create movement report

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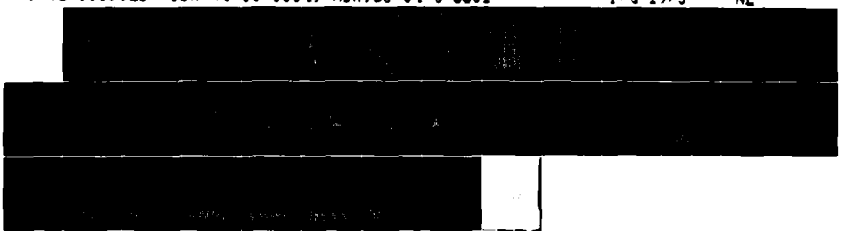

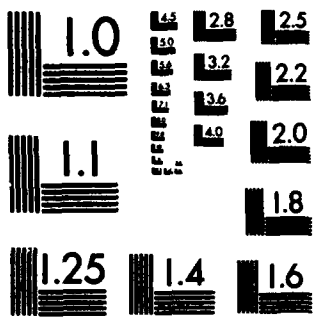

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

19. PREPARE FA MOVEMENT REQUEST(S)
    - Create movement table
        - Determine movement route
        - Determine movement controls
        - Determine movement times
        - Create movement table
    - Resolve movement table conflicts
        - Analyze movement route for conflicts
        - Analyze movement times for conflicts
        - Resolve conflicts
        - Update movement table
    - Prepare movement request
    - Perform movement table maintenance

FIELD ARTILLERY FIRE DIRECTION OPERATIONS

20. DETERMINE FIRE UNIT CAPABILITY
    - Create weapons data files
        - Weapon location/altitude file
        - Weapon ammunition file
        - Weapon mask file
        - Weapon operational file
    - File maintenance
        - Update location/altitude file
        - Update weapon mask file
        - Update weapon operational file

21. PERFORM FIRE MISSION PROCESSING
    - Perform cannon fire mission
        - Prepare fire commands
        - Create end of mission sequence

22. PERFORM FIRE MISSION STATUS REPORTING
    - Create FA mission status files
        - Weapons allocated
        - Fire orders issues

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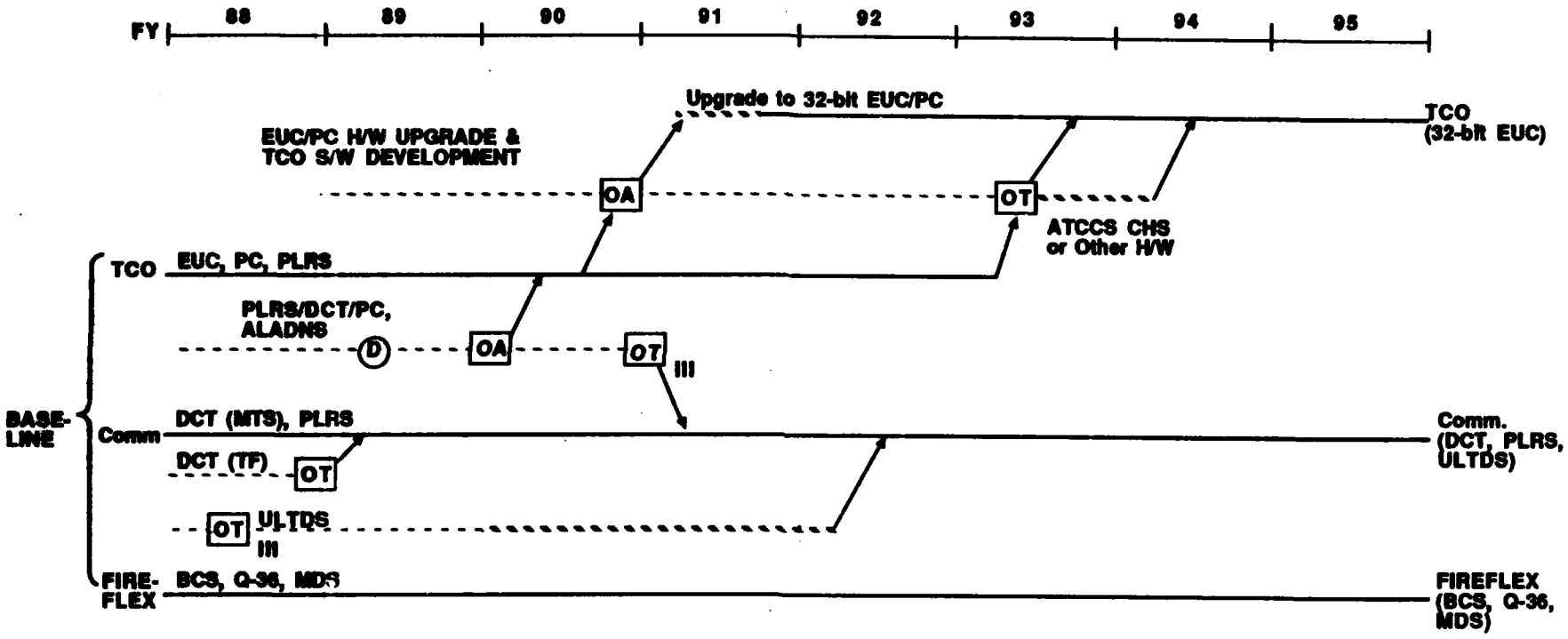
APPENDIX B

ADDITIONAL INFORMATION

INTERFACE REQUIREMENTS FOR EXISTING AND PLANNED SYSTEMS

SYSTEM	SYSTEM REQUIREMENTS		FIELDED AND SOON TO BE FIELDED MARINE CORPS SYSTEMS						CANDIDATE FIRE SUPPORT SYSTEMS						
	FIRE-FLEX ROC	MIFASS ROC	ULTDS	PLRS	DCT (MTS)	BCS	Q-36	MDS	FIST DMD	MOD FIST DMD	LTACFIRE	MOD LTACFIRE	AFATDS	AFATDS + MC FNCTS	MAFATDS
MC Systems & Devices, Req'd:															
BCS	X	X	-	-	-	X	X	X	X	X	X	X	X	X	X
DCT (MTS)	X	X	-	-	X	-	-	-	-	R&D	R&D	X	-	X	X
DCT (TF)	X	-	-	-	-	X	X	X	X	X	X	X	X	X	X
MDS	X	X	-	-	-	X	-	?	-	X	X	X	X	X	X
MULE	X	-	-	-	?	-	-	-	-	-	-	-	X	X	X
NTDS	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
PLRS/EPLRS	X	X	-	X	-	-	-	-	-	TBD	-	-	-	-	TBD
Q-36	X	X	-	-	-	X	?	X	X	X	X	X	X	X	X
TACM	-	X	R&D	?	R&D	-	-	-	-	-	-	-	-	-	TBD
TDD	-	X	-	R&D	-	-	-	-	-	-	-	-	-	-	TBD
ULTDS	X	X	X	-	-	-	-	-	-	-	-	-	-	-	TBD
MC Systems & Devices, Other:															
ATACC	-	-	R&D	?	-	-	-	-	-	-	-	-	-	-	TBD
EUC/PCs	-	-	-	R&D	-	-	-	-	-	-	-	-	-	-	TBD
IDASC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIMS	-	-	-	R&D	-	-	-	-	-	-	-	-	-	-	TBD
Other Army/NATO Systems & Devices:															
ADLER	-	X	-	-	-	-	-	-	-	-	-	-	BLK 2/3	BLK 2/3	BLK 2/3
AFATDS	X	-													
BATES	-	X	-	-	-	-	-	-	-	-	-	-	BLK 2/3	BLK 2/3	BLK 2/3
DMD	-	-	-	-	-	X	?	-	X	X	X	X	X	X	X
FIST DMD	X	-	-	-	-	X	X	X	X	X	X	X	X	X	X
HIP	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-
LTACFIRE	X	-	-	-	-	X	X	X	X	X	X	X	X	X	X
MBC	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
MCS	-	-	-	-	-	-	-	-	-	-	-	-	BLK 2/3	BLK 2/3	BLK 2/3
MLRS	X	-	-	-	-	-	-	-	-	-	X	X	BLK 1	BLK 1	BLK 1
TACFIRE	X	X	-	-	-	X	X	X	X	X	X	X	X	X	X
VFMED	-	-	-	-	-	-	-	-	?	?	X	X	?	?	?

BASELINE SYSTEMS AND POTENTIAL UPGRADES

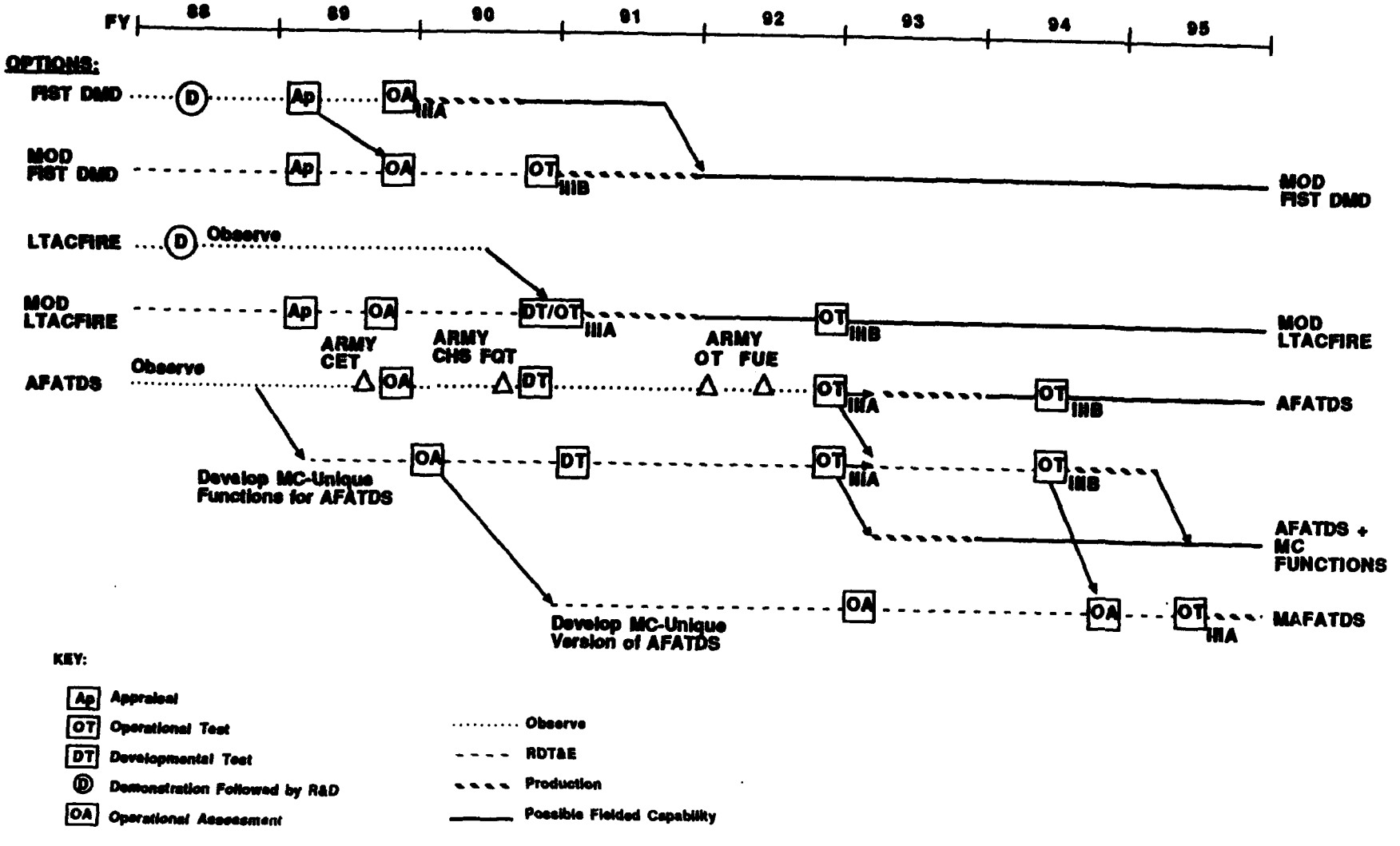


KEY:

- OT — Operational Test
- DT — Developmental Test
- D — Demonstration Followed by R&D
- OA — Operational Assessment
- III — Milestone III Production Decision
- ..... Observe
- - - - RDT&E
- ----- Production
- ——— Possible Fielded Capability

PROPOSED SCHEDULE OF FIRE SUPPORT C2 OPTIONS

(MORE THAN ONE OPTION IN OUT YEARS MAY BE DESIRABLE)



ACQUISITION ISSUES

- TO WHAT DEGREE SHOULD A FIELD ARTILLERY C2 SYSTEM INCLUDE FIRE SUPPORT COORDINATION FUNCTIONS FROM MANEUVER CONTROL?
- WHAT FUNCTIONS AND DEGREE OF AUTOMATION ARE REQUIRED FOR AIR SUPPORT INTEGRATION?
- TO WHAT DEGREE CAN FIRE SUPPORT AUTOMATION BE EXPECTED TO PROVIDE INCREASED RESPONSIVENESS FOR FIRE SUPPORT COORDINATION AND FIELD ARTILLERY MISSION EXECUTION?
- SHOULD THE MARINE CORPS IMPLEMENT BOTH MTS AND TACFIRE PROTOCOLS IN FIRE SUPPORT C2 SYSTEMS TO ACHIEVE INTRAOPERABILITY?
- DO COST AND TIME DIFFERENTIALS BETWEEN RUGGEDIZED COMMERCIAL AND FULL MILSPEC HARDWARE JUSTIFY REDUCING ENVIRONMENTAL REQUIREMENTS FOR FIRE SUPPORT C2 SYSTEMS?
- SHOULD THE MARINE CORPS PURSUE AN APPROACH BASED ON FIELD-DEVELOPED SOFTWARE OR, ALTERNATIVELY, FOCUS ON MODIFYING DEVELOPED ARCHITECTURES SUCH AS LTACFIRE OR AFATDS?
- CAN THE MARINE CORPS AFFORD BOTH A NEAR-TERM FIRE SUPPORT SYSTEM AND AN OBJECTIVE SYSTEM IN THE 1990s?

OBSERVATIONS--SYSTEM OPTIONS

- MOD FIST DMD: LIMITED CAPABILITY FOR TACTICAL FIRE DIRECTION & FIRE SUPPORT COORDINATION--IT INTERFACES WITH BCS AND Q-36
- (MOD) LTACFIRE: VERY EXPENSIVE AS A NEAR-TERM OPTION, BUT CAN SUPPORT BOTH TACTICAL FIRE DIRECTION AND SOME DEGREE OF FIRE SUPPORT COORDINATION; INTERFACES WITH BCS AND Q-36
- AFATDS: A CANDIDATE FOR THE OBJECTIVE FIRE SUPPORT SYSTEM, BUT NEEDS TO BE ADAPTED TO MARINE CORPS NEEDS
  - Operational assessment of adaptability is needed
  - Development of some functions could be started soon
- SINCE MANEUVER CONTROL INCLUDES CRITICAL FIRE SUPPORT COORDINATION FUNCTIONS, A MANEUVER (TCO) SYSTEM MAY BE REQUIRED TO SUPPORT FULL RANGE OF FIRE SUPPORT REQUIREMENTS
- PLRS/PC CONCEPT: HAS POTENTIAL TO EVOLVE INTO A SINGLE-SYSTEM OPTION FOR FIREMAN THAT FITS COMM ARCHITECTURE; MIX OF NDI AND NEW DEVELOPMENT SOFTWARE NOT CLEAR
- AGREEMENT NEEDED ON JOINT BIT-ORIENTED INFORMATION EXCHANGE PROTOCOLS (VMF TIDP); ARMY & USMC HAVE AGREED ON FIRE SUPPORT MESSAGE FORMATS

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APPENDIX C

BACKGROUND, OBJECTIVE, AND STATEMENT OF WORK

APPENDIX C
BACKGROUND, OBJECTIVE, AND STATEMENT OF WORK

(U) This IDA Report was written in response to Task Order T-F1-550. Those portions of the task order that pertain to the background and objectives of the task, and the statement of work provided therein and in amendment No. 3 by the sponsoring office, are reprinted here.

2. BACKGROUND

a. The Army and Marine Corps have, for a number of years, been developing computers and automated data processing (ADP) systems to support their battlefield fire control functions. The Army's Advanced Field Artillery Tactical Data System (AFATDS) is in initial development with a concept evaluation test (CET) planned for FY 1988 and integration with common hardware and software for the Army Command and Control System procurement in the latter part of FY 1988. The Marine Corps was developing the Marine Integrated Fire and Air Support System (MIFASS). However, the Marine Corps recently cancelled this program. They plan to review the fire and air support requirements and rewrite the Required Operational Capability (ROC) for this subject area. The Marine Corps will also be assessing the capability of AFATDS to meet its requirements and developing acquisition strategies for a Marine Corps version of AFATDS.

b. OUSD(A)/TWP and ASD(C3I) continue to review the development of the system(s) to meet the Army and Marine Corps requirements, to ensure the maximum cross-Service commonality and interoperability.

3. OBJECTIVE

The objective of this task is to provide an assessment of the requirements, system concept, development approach, and acquisition plan for automated data processing (ADP) for USMC fire and air support; and to evaluate alternatives for adapting the U.S. Army AFATDS to meet these needs.

4. STATEMENT OF WORK

a. Review the relevant documentation, including Service inputs, and observe tests and demonstrations of equipment and software. Hold discussions with the military users and developers and their contractors.

b. Review the revised Marine Corps Required Operational Capability statement for fire and air support and assess the potential of AFATDS as currently programmed to meet these requirements.

c. Assess the Marine Corps and Army positions on opportunities for cooperative development and consolidation of efforts in the fire support area.

d. Evaluate additional alternatives for attaining cross-Service commonality and interoperability while meeting validated Service requirements.

Amendment No. 2 continues the above tasks, but expands their scope to include: (1) conducting a top-level feasibility analysis of the options and potential recommendations already identified for using existing and emerging systems to meet Marine Corps fire support requirements; (2) conducting further analysis of potential ways to adapt existing and emerging systems to meet these requirements; and (3) identifying technical concerns related to portability and interoperability issues for Army-Marine Corps information exchange standards for bit-oriented messages (BOMs) and protocols.

This amendment provides for the preparation of a draft plan for an operational assessment by the Marine Corps of the Army's Field Artillery Tactical Data System. This plan will address potential test objectives and the tasks required to plan, execute, and evaluate the assessment.

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APPENDIX D

GLOSSARY

GLOSSARY

ACE	Air Combat Element
AFATDS	Advanced Field Artillery Tactical Data System
ALADNS	Automatic Location and Data Netting System (PLRS modification)
ASR	air support request
ATACC	Advanced Tactical Air Command Center
ATCCS	Army Tactical Command and Control System (formerly ACCS)
ATO	Air Tasking Order
BCS	Battery Computer System
BCT	Briefcase Terminal (LTACFIRE)
Bn	Battalion
BTRY	Battery
BUCS	Backup Computer System
C2	command and control
C2IE	Command and Control Information Exchange (element)
C3	command, control, and communications
C3I	command, control, communications, and intelligence
C4	command, control, communications, and computers
C4I2	command, control, communications, computers, intelligence, and interoperability
CCS	Command and Control Systems
CE	Concept Evaluation
CECOM	U.S. Army Communications-Electronics Command
CHS	Common Hardware/Software (Army procurement)
CNR	combat net radios
CO	Company
COC	Combat Operations Center
CPX	command post exercise

DASC	Direct Air Support Center
DCT	Digital Communications Terminal
DIV	Division
DMD	Digital Message Device (TACFIRE)
DS	direct support
DT	developmental test
EEPROM	electronically erasable programmable read-only memory
EOB	Enemy Order of Battle
EUC	End-User Computer
FA	field artillery
FAC	Forward Air Controller
FATDS	Field Artillery Tactical Data Systems (CECOM Program Office)
FAX	facsimile
FDC	Fire Direction Center
FIREFLEX	Flexible Fire Support Coordination System
FIREMAN	Fire Support and Maneuver (system Concept)
FIST	Fire Support Team
FMF	Fleet Marine Force
FO	Forward Observer
FOC	full operational capability
FS	fire support
FSC	Fire Support Coordination (AFATDS function)
FSCC	Fire Support Coordination Center
FSCM	fire support coordination measure
FSE	Fire Support Element
FSK	frequency shift keying
FSP	Fire Support Planning (AFATDS function)
FSSG	Fire Support Subgroup (JTC3A)
FUE	first unit equipped
GCE	Ground Combat Element
HIP	Howitzer Improvement Program
HW	hardware

I/F	interface
IEW	intelligence and electronic warfare
IOC	initial operational capability
IOT&E	initial operational test and evaluation
JINTACCS	Joint Interoperability Tactical Command and Control System (Program)
JMEM	Joint Munitions Effectiveness Manual
JTC3A	Joint Tactical Command, Control, and Communications Agency
LTACFIRE	Lightweight Tactical Fire Direction System (Briefcase Terminal)
LW	Land Warfare
MAFATDS	Marine version of AFATDS
MAGTF	Marine Air Ground Task Force
MARDIV	Marine Division
MC	Marine Corps
MCAGCC	Marine Corps Air Ground Combat Center
MCCDC	Marine Corps Combat Development Command
MCOTEA	Marine Corps Operational Test and Evaluation Agency
MCRDAC	Marine Corps Research, Development, and Acquisition Command
MCS	Maneuver Control System (U.S. Army)
MCTSSA	Marine Corps Tactical Systems Support Activity
MDS	Meteorological Data System
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MIFASS	Marine Integrated Fire and Air Support System
MILSPEC	Military Specification
MOD	Modifications
MTF	U.S. Message Text Format (character-oriented)
MTS	Marine Tactical System (bit-oriented protocols and messages)
NATO	North Atlantic Treaty Organization
NBC	Nuclear, biological, and chemical
NDI	nondevelopmental item
NGF	Naval Gunfire
NGST	naval gunfire spotter

OA	operational assessment
OASD	Office of the Assistant Secretary of Defense
OCC	Operator Contropl Console (AFATDS)
OPFAC	operational facility
OSD	Office of the Secretary of Defense
OT	operational test
OTEA	Operational Test and Evaluation Agency (U.S. Army)
OUSD(A)	Office of the Under Secretary of Defense for Acquisition
P3I	preplanned product improvements
PC	personal computer
PEO	Program Executive Officer
PLI	position location information
PLRS	Position Location Reporting System
PM	Program Manager
Q-36	AN/TPQ-36 FIREFINDER Radar
R&D	research and development
RD&S	Research, Development, and Studies
RDT&E	research, development, test, and evaluation
REGT	Regiment
REIN	reinforced
ROC	Required Operational Capability
S/W	software
SACC	Supporting Arms Coordination Center (afloat)
SASS	Supporting Arms Special Staff
SIM/STIM	Simulator/Stimulator
SOP	standard operational procedure
TA	target acquisition
TACFIRE	Tactical Fire Direction System
TACOPS	tactical operations
TAOC	Tactical Air Operations Central
TAOM	Tactical Air Operations Module (air defense)
TAR	tactical air request

TCO	Tactical Combat Operations (maneuver system concept)
TDA	target damage assessment
TDY	temporary duty
TF	TACFIRE (protocols and messages)
TGP	Target Generation and Processing (AFATDS function)
TIDP	technical interface design plan
TIMS	Tactical Intelligence Management System
TOEL	time ordered event list
TOT	time on target
TRADOC	U.S. Army Training and Doctrine Command
TWP	Tactical Warfare Programs
ULTDS	Unit Level Tactical Data Switch (formerly Unit Level Message Switch)
VMF	variable message format (bit-oriented)

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APPENDIX E

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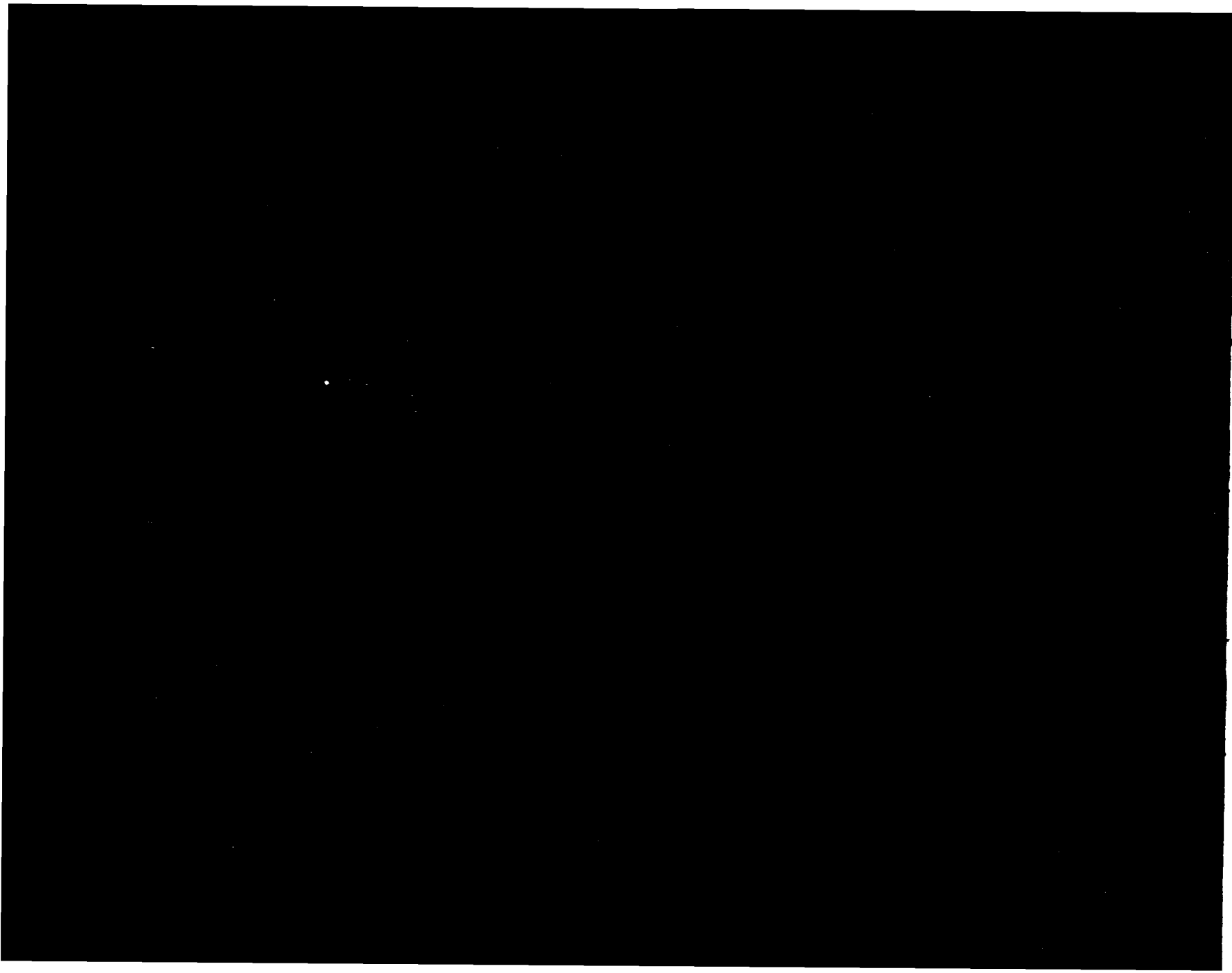

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